INEL
Idaho National Engineering Laboratory
Environmental Restoration

REV 1

ORIGINAL SIGNATURES INCLUDED

WINCO Environmental Restoration

Track 1 Decision Documentation Package

Waste Area Group 3

Operable Unit 2

Site CPP-64

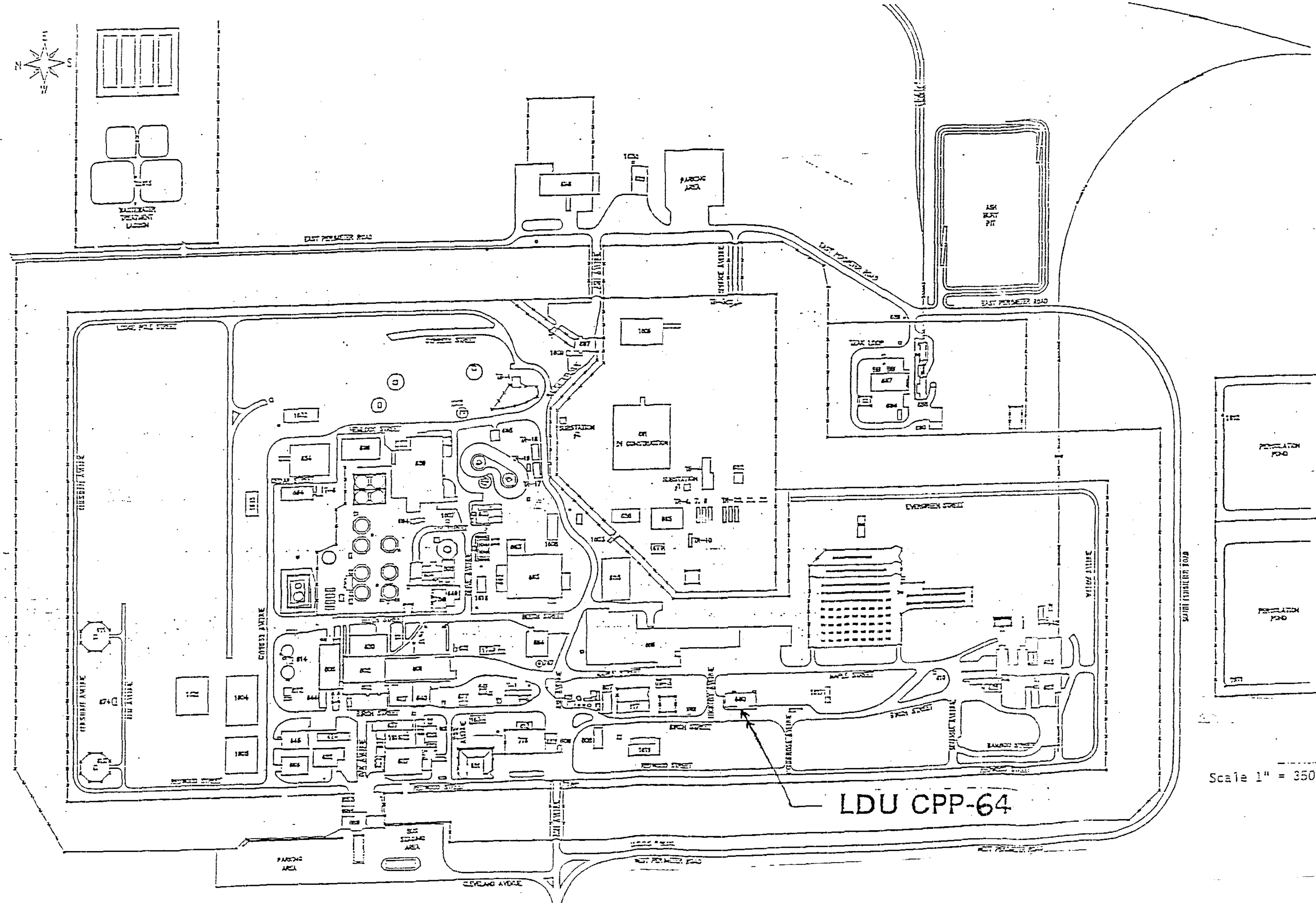
Hexone spill west of CPP-660

DEPARTMENT OF ENERGY · UNITED STATES OF AMERICA

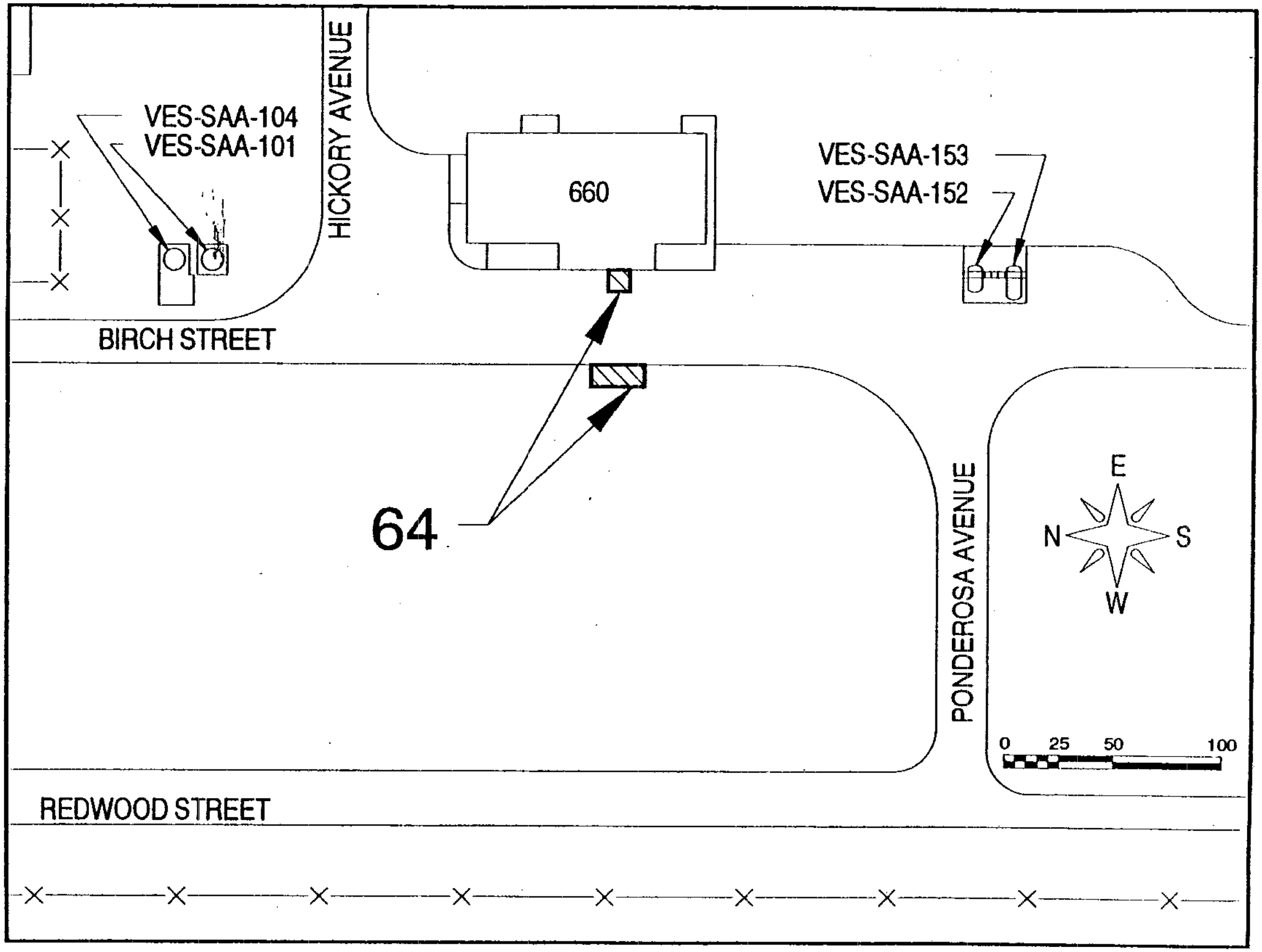
Westinghouse Idaho Nuclear Company, Inc.

Idaho National Engineering Laboratory

U.S. Department of Energy, Idaho Field Office


LDU CPP-64
EAST PERIMETER ROAD
PARKING AREA
ASH BURY PIT
PERCOLATION POND
PERCOLATION POND
EVERGREEN STREET
SUBSTATION
CLEVELAND AVENUE

Scale 1" = 350'



ICPP-A-18525
(6-92)

CPP-64 - Hexone Spill West of CPP-660

NO FURTHER ACTION DETERMINATION

The U. S. Department of Energy, U.S. Environmental Protection Agency-Region 10 and the State of Idaho have completed a review of the referenced information for CPP-64 hazardous site, as it pertains to the INEL Federal Facility Agreement of 12-9-91. Based on this review, the Parties have determined that no further action for purposes of investigation or study is justified. This decision is subject to review at the time of issuance of the Record of Decision.

Brief Summary of the basis for no further action:

EPA - 55 gal hexone spill onto ice & snow covered asphalt. Spill response included using absorbant and removal of spill materials

DOE - See attached

IDHW - See attached

References:

EPA - Westinghouse UOR & Golder Jan 91 Report

DOE - Track 1 documentation and references

IDHW - Track 1 documentation package.

DOE Project Manager Lisa A Green for J Lyle 9/14/92
date

EPA Project Manager Wayne Pierre 9/14/92
date

Idaho Project Manager R. Dial Hall for Dean Nygard 9/14/92
date

DECISION DOCUMENTATION PACKAGE
COVER SHEET

PREPARED IN ACCORDANCE WITH

TRACK 1 SITES: GUIDANCE FOR ASSESSING LOW PROBABILITY HAZARD SITES AT INEL

SITE DESCRIPTION: HEXONE SPILL WEST OF CPP-660

SITE ID: 64 **OPERABLE UNIT: 2**

WASTE AREA GROUP: 3

I. SUMMARY - PHYSICAL DESCRIPTION OF THE SITE:

Site 64 is located immediately west of building CPP-660, Chemical Storage Warehouse. Zone 1 is adjacent to CPP-660 and is an asphalt pad of approximately 10 feet by 10 feet. Zone 2 is west of Birch Street and is an unpaved gravel area of approximately 10 feet by 25 feet. On 2/14/84 a warehouse worker using a forklift to pick up hexone drums, pierced a barrel. 55 gallons of hexone leaked to the asphalt (Zone 1). Vermiculite was used to absorb most of the hexone. This vermiculite and contaminated snow was pushed across the road (Zone 2) until personnel could clean it up. The vermiculite from Zone 2 was barreled and disposed of. Both Zone 1 (asphalt pad) and Zone 2 (unpaved soil area) were sampled. Some residual vermiculite was placed in Zone 2 after the initial cleanup effort, however, analysis of Zones 1 & 2 showed no concentrations of concern.

II. SUMMARY - QUALITATIVE ASSESSMENT OF RISK:

The qualitative risk assessment at this site for any hazardous substance/constituent is considered low because all substances are below the risk-based soil screening concentrations. The risk assessment and closure plan for site CPP-64 determined that no inorganics detected at CPP-64 pose a risk to human health or the environment and it is unlikely that permissible exposure levels would be exceeded.

III. SUMMARY - CONSEQUENCES OF ERROR:

If remedial actions, such as removal of soil are taken and there is no need, there would be unnecessary expenditure of funds that could be used in remediation of other sites with greater risk.

IV. SUMMARY - OTHER DECISION DRIVERS:

RECOMMENDED ACTION:

No action is recommended for this site since there is no danger to human health or the environment based upon the Golder sampling results (Reference 2) for both Zone 1 and Zone 2.

SIGNATURES	# PAGES:	DATE:
Prepared By:	DOE WAG Manager:	
Approved By:	Independent Review:	

DECISION STATEMENT
(BY DOE RPM)

DATE RECD: 9/14/92

DISPOSITION: CPP-64 requires no further action based on insignificant risk posed by hazardous substances.

DATE: 9/14/92	# PAGES (DECISION STATEMENT):
NAME: Lisa A. Green for Skyla	SIGNATURE: Lisa A Green for JLL

DECISION STATEMENT
(BY EPA RPM)

DATE RECD: 9/14/92 CPP - 64

DISPOSITION:

Track I writeup is not basis for evaluation as many questions went unanswered. Evaluation based primarily on Golden Report and Westinghouse UOR. Basis for addressing site is known spill of kepone. 55 gal spill in '84 with snow & ice on asphalt and absorbant used after spill observed. No observed release beyond asphalt to soil. Kepone not observed in Golden sampling. Other contaminants associated with WAG-wide chemicals most ~~and~~ were not observed in significant concentrations, but should be revisited during WAG-wide RI/FS. Based on above no further ~~act~~ investigation appears necessary

DATE: 9/14/92	# PAGES (DECISION STATEMENT): 1
NAME: Wayne Pierre	SIGNATURE: Wayne Pierre

DECISION STATEMENT
(BY STATE RPM)

DATE RECD: 9/14/92

DISPOSITION: CPP-64

This site represented two areas of soil contamination from a one-time 55-gal spill of Hexone (Methyl Isobutyl Ketone). The package information states ICPP records indicate that a warehouse worker pierced a drum of Hexone (in 1984) with a forklift and the material was discharged onto snow covered ground. The area was covered with vermiculite to adsorb the spilled Hexone. Two areas were contaminated as the involved snow was pushed across a roadway onto a paved area. The vermiculite with sorbed Hexone was containerized and removed.

Both areas were characterized in late 1990 and the sites were determined to pose no unacceptable risk for Hexone.

The State recommends that no further action is warranted because as this Track-1 package discusses that the source has been removed, and the subsequent 1990 sampling indicates the contaminants that remain on-site are below conservative risk evaluated concentrations.

DATE: 9/14/92	# PAGES (DECISION STATEMENT):
NAME: R. David Howard	SIGNATURE: R. D. Howard

PROCESS/WASTE WORKSHEET
SITE ID 64

Col 1 Processes Associated with this Site	Col 2 Waste Description & Handling Procedures	Col 3 Description & Location of any Artifacts/Structures/Disposal Areas Associated with this Waste or Process
Process Temporary drum storage pad in Zone 1.	Hexone drums were placed on pallets and picked up by forklift and moved to other areas for storage. While attempting to pick up and move several drums one of the drums was pierced by one of the forklift tines, spilling roughly 55 gallons of hexone.	Artifact Building CPP-660 Location ICPP corner of Birch Street and Hickory Avenue Description Chemical Storage Warehouse
		Artifact Asphalt pad adjacent to building CPP-660 Location West side of building CPP-660 Description Asphalt pad of approximately 100 square feet
		Artifact Location Description
Process Temporary placement of hexone spill material in Zone 2.	Snow, ice, and vermiculite contaminated with hexone temporarily stored on site until it could be cleaned up and disposed of.	Artifact Building CPP-660 Location ICPP corner of Birch Street and Hickory Avenue Description Chemical Storage Warehouse
		Artifact Birch Street Location Directly west of building CPP-660 Description Road
		Artifact Unpaved gravel area Location West of building CPP-660 and Birch Street Description Unpaved gravel area of approximately 250 square feet
Process		Artifact Location Description
		Artifact Location Description
		Artifact Location Description

CONTAMINANT WORKSHEET

SITE ID 64

PROCESS (Col 1) Temporary Drum Storage Area WASTE (Col 2) Hexone drums

Col 4 What known/potential hazardous substances/constituents are associated with this waste or process?	Col 5 Potential sources associated with this hazardous material	Col 6 Known/estimated concentration of hazardous substances/constituents[a]	Col 7 Risk based concentration mg/kg	Col 8 Qualitative risk assessment (Hi/Med/Lo)	Col 9 Overall reliability (Hi/Med/Lo)
Hexone	Contaminated Soil	ND	8.37E+01	Lo	Hi
Mercury	Contaminated Soil	.12 mg/kg	8.1E+01	Lo	Hi
Lead	Contaminated Soil	41.3 mg/kg	*	Lo	Hi

a. ND = not detected
DL = detection limit in ppm

* Lead toxicity data was not available for any pathway, there exists interim quidance on soil lead cleanup levels at Superfund sites that can be used for screening. OSWER Directive #9355.4-02 gives a range of 500 to 1000 ppm.

PROCESS CPP-64

Question 1. What are the waste generation process locations and dates of operation associated with this site?

Block 1 Answer:

Site 64 is located along the west side of CPP-660 along Birch Street between Hickory Avenue and Ponderosa Avenue. CPP-64 includes two zones of potential contamination. On 2/14/84, a 55 gallon drum containing hexone was pierced by a forklift tine spilling the contents on the snow and ice covered asphalt pad (Zone 1). Vermiculite was poured on the spill to absorb the hexone. The contaminates were pushed across the street to Zone 2 until it could be cleaned up on 2/17/84.

Block 2 How reliable is/are the information source/s? X High __Med __Low (check one)

EXPLAIN THE REASONING BEHIND THIS EVALUATION.

A UOR was issued on the spill.

Block 3 Has this INFORMATION been confirmed? X Yes __No (check one)

IF SO, DESCRIBE THE CONFIRMATION.

Conversation with Mark Hanson (Foreman) and Bruce Ellis (Forklift Operator).

Block 4 **SOURCES OF INFORMATION** (check appropriate box/es & source number from reference list)

No available information	[ ]		Analytical data	[ ]	
Anecdotal	[ ]		Documentation about data	[ ]	
Historical process data	[ ]		Disposal data	[ ]	
Current process data	[ ]		Q.A. data	[ ]	
Areal photographs	[ ]		Safety analysis report	[ ]	
Engineering/site drawings	[ ]		D&D report	[ ]	
Unusual Occurrence Report	[X]	1	Initial assessment	[ ]	
Summary documents	[X]	2	Well data	[ ]	
Facility SOPs	[ ]		Construction data	[ ]	
OTHER	[X]	3			

Question 2. What are the disposal process locations and dates of operation associated with this site?

Block 1 Answer:

Temporary storage pad for drums of organic solvents and other chemicals. Spill occurred on 2/14/84 and was cleaned up during the next three days to 2/17/84.

Block 2 How reliable is/are the information source/s? X High __Med __Low (check one)

EXPLAIN THE REASONING BEHIND THIS EVALUATION.

Site documentation was very good, a UOR was issued on the incident.

Block 3 Has this INFORMATION been confirmed? X Yes __No (check one)

IF SO, DESCRIBE THE CONFIRMATION.

Conversation with Mark Hanson (Foreman), Bruce Ellis (Forklift Operator), and B. Marcinko.

Block 4 SOURCES OF INFORMATION (check appropriate box/es & source number from reference list)

No available information	[ ]		Analytical data	[ ]	
Anecdotal	[ ]		Documentation about data	[ ]	
Historical process data	[ ]		Disposal data	[ ]	
Current process data	[ ]		Q.A. data	[ ]	
Areal photographs	[ ]		Safety analysis report	[ ]	
Engineering/site drawings	[ ]		D&D report	[ ]	
Unusual Occurrence Report	[X]	1	Initial assessment	[ ]	
Summary documents	[X]	2	Well data	[ ]	
Facility SOPs	[ ]		Construction data	[ ]	
OTHER	[X]	3			

Question 3. Is there empirical, circumstantial, or other evidence of migration? If so, what is it?

Block 1 Answer:

No, there is no evidence of migration.

Block 2 How reliable is/are the information source/s? X High __Med __Low (check one)

EXPLAIN THE REASONING BEHIND THIS EVALUATION.

Samples were taken at the site for analysis.

Block 3 Has this INFORMATION been confirmed? X Yes __No (check one)

IF SO, DESCRIBE THE CONFIRMATION.

Hexone was not present in the samples taken and analyzed from the site

Block 4 **SOURCES OF INFORMATION** (check appropriate box/es & source number from reference list)

No available information	[ ]		Analytical data	[X]	2
Anecdotal	[ ]		Documentation about data	[ ]	
Historical process data	[ ]		Disposal data	[ ]	
Current process data	[ ]		Q.A. data	[ ]	
Areal photographs	[ ]		Safety analysis report	[ ]	
Engineering/site drawings	[ ]		D&D report	[ ]	
Unusual Occurrence Report	[ ]		Initial assessment	[ ]	
Summary documents	[X]	2	Well data	[ ]	
Facility SOPs	[ ]		Construction data	[ ]	
OTHER	[ ]				

Question 4. Is there evidence that a source exists at this site? If so, list the sources and describe the evidence.

Block 1 Answer:

No.

Block 2 How reliable is/are the information source/s? __High __Med __Low (check one)
EXPLAIN THE REASONING BEHIND THIS EVALUATION.

Block 3 Has this INFORMATION been confirmed? __Yes __No (check one)
IF SO, DESCRIBE THE CONFIRMATION.

Block 4 SOURCES OF INFORMATION (check appropriate box/es & source number from reference list)

No available information	[ ]	______	Analytical data	[ ]	______
Anecdotal	[ ]	______	Documentation about data	[ ]	______
Historical process data	[ ]	______	Disposal data	[ ]	______
Current process data	[ ]	______	Q.A. data	[ ]	______
Areal photographs	[ ]	______	Safety analysis report	[ ]	______
Engineering/site drawings	[ ]	______	D&D report	[ ]	______
Unusual Occurrence Report	[ ]	______	Initial assessment	[ ]	______
Summary documents	[ ]	______	Well data	[ ]	______
Facility SOPs	[ ]	______	Construction data	[ ]	______
OTHER	[ ]	______			

Question 5. Does site operating or disposal historical information allow estimation of the pattern of potential contamination? If the pattern is expected to be a scattering of hot spots, what is the expected minimum size of a significant hot spot?

Block 1 Answer:

No. There is only documentation of a one-time spill of Hexone.

Block 2 How reliable is/are the information source/s? __High __Med __Low (check one)

EXPLAIN THE REASONING BEHIND THIS EVALUATION.

Block 3 Has this INFORMATION been confirmed? __Yes __No (check one)

IF SO, DESCRIBE THE CONFIRMATION.

Block 4 **SOURCES OF INFORMATION** (check appropriate box/es & source number from reference list)

No available information	[ ]	______	Analytical data	[ ]	______
Anecdotal	[ ]	______	Documentation about data	[ ]	______
Historical process data	[ ]	______	Disposal data	[ ]	______
Current process data	[ ]	______	Q.A. data	[ ]	______
Areal photographs	[ ]	______	Safety analysis report	[ ]	______
Engineering/site drawings	[ ]	______	D&D report	[ ]	______
Unusual Occurrence Report	[ ]	______	Initial assessment	[ ]	______
Summary documents	[ ]	______	Well data	[ ]	______
Facility SOPs	[ ]	______	Construction data	[ ]	______
OTHER	[ ]	______			

Question 6. Estimate the length, width, and depth of the contaminated region. What is the known or estimated volume of the source? If this is an estimated volume, explain carefully how the estimate was derived.

Block 1 Answer:

N/A

Block 2 How reliable is/are the information source/s? __High __Med __Low (check one)
EXPLAIN THE REASONING BEHIND THIS EVALUATION.

Block 3 Has this INFORMATION been confirmed? __Yes __No (check one)
IF SO, DESCRIBE THE CONFIRMATION.

Block 4 SOURCES ~~OF~~ INFORMATION (check appropriate box/es & source number from reference list)

No available information	[ ]	______	Analytical data	[ ]	______
Anecdotal	[ ]	______	Documentation about data	[ ]	______
Historical process data	[ ]	______	Disposal data	[ ]	______
Current process data	[ ]	______	Q.A. data	[ ]	______
Areal photographs	[ ]	______	Safety analysis report	[ ]	______
Engineering/site drawings	[ ]	______	D&D report	[ ]	______
Unusual Occurrence Report	[ ]	______	Initial assessment	[ ]	______
Summary documents	[ ]	______	Well data	[ ]	______
Facility SOPs	[ ]	______	Construction data	[ ]	______
OTHER	[ ]	______			

PROCESS CPP-64

Question 7. What is the known or estimated quantity of hazardous substance/constituent at this source? If the quantity is an estimate, explain carefully how the estimate was derived.

Block 1 Answer:

N/A

Block 2 How reliable is/are the information source/s? __High __Med __Low (check one)

EXPLAIN THE REASONING BEHIND THIS EVALUATION.

Block 3 Has this INFORMATION been confirmed? __Yes __No (check one)

IF SO, DESCRIBE THE CONFIRMATION.

Block 4 SOURCES OF INFORMATION (check appropriate box/es & source number from reference list)

No available information	[ ]	______	Analytical data	[ ]	______
Anecdotal	[ ]	______	Documentation about data	[ ]	______
Historical process data	[ ]	______	Disposal data	[ ]	______
Current process data	[ ]	______	Q.A. data	[ ]	______
Areal photographs	[ ]	______	Safety analysis report	[ ]	______
Engineering/site drawings	[ ]	______	D&D report	[ ]	______
Unusual Occurrence Report	[ ]	______	Initial assessment	[ ]	______
Summary documents	[ ]	______	Well data	[ ]	______
Facility SOPs	[ ]	______	Construction data	[ ]	______
OTHER	[ ]	______			

Question 8. Is there evidence that this hazardous substance/constituent is present at the source as it exists today? If so, describe the evidence.

Block 1 Answer:

N/A

Block 2 How reliable is/are the information source/s? __High __Med __Low (check one)

EXPLAIN THE REASONING BEHIND THIS EVALUATION.

Block 3 Has this INFORMATION been confirmed? __Yes __No (check one)

IF SO, DESCRIBE THE CONFIRMATION.

Block 4 SOURCES ~~OF~~ INFORMATION (check appropriate box/es & source number from reference list)

No available information	[ ]	______	Analytical data	[ ]	______
Anecdotal	[ ]	______	Documentation about data	[ ]	______
Historical process data	[ ]	______	Disposal data	[ ]	______
Current process data	[ ]	______	Q.A. data	[ ]	______
Areal photographs	[ ]	______	Safety analysis report	[ ]	______
Engineering/site drawings	[ ]	______	D&D report	[ ]	______
Unusual Occurrence Report	[ ]	______	Initial assessment	[ ]	______
Summary documents	[ ]	______	Well data	[ ]	______
Facility SOPs	[ ]	______	Construction data	[ ]	______
OTHER	[ ]	______			

REFERENCES

1. Westinghouse Idaho Nuclear Company, Inc., Unusual Occurrence Report, Report No: 84-16, 3/20/84 and 5/8/85.

2. Golder Associates Inc., *Report For The Idaho Chemical Processing Plant Drilling and Sampling Program at Land Disposal Unit CPP-64,* January 1991.

3. Personal Conversation with Bob Marcinko, Mark Hanson, and Bruce Ellis, 6/27/89.

4. Track 1 Risk Evaluation Summary for Site CPP-64, performed by EG&G Idaho, 1/24/92.

Reference 1

FORM WINCO-5690 (5-84)

Westinghouse Idaho
Nuclear Company, Inc.

UNUSUAL OCCURRENCE REPORT

1. Report No.: 84-16

Distribution:
Standard Final Dist.
D. S. Crockett

2. (a) Initial: Date: 3/20/84

(b) Final: XXX Date: 5/8/85

0045117

3. Division or Project:
Idaho Chemical Processing Plant

4. Facility, system, or equipment:
CPP-660, Chemical Storage Facility

RECEIVED
MAY 1 0 1985
J. A. GRUHSKI

5. Date and time of occurrence:
02/14/84; 1000 Hours

6. Occurrence subject:
Inadvertent Hexone Spill

7. Apparent cause:

Design: Material: Personnel: Procedure: XXX Other: XXX

8. Description of occurrence:

Chemicals at the ICPP are often stored in barrels in a central location, CPP-660, and moved with a forklift to other plant areas as necessary. The storage facility utilizes a storage pad outside the building which has several readily accessible pallets used for lifting more than one barrel at once.

On 02/14/84 at about 1000 hours, a Warehouse worker was using the forklift to pick up chemicals from one of the pallets. However, the worker could not see because of ice and snow which had accumulated between pallets, and the right forklift tine slipped, piercing a barrel on the back pallet. As a result, 55 gallons of hexone leaked from the barrel onto a snow-covered surface.

47

FORM WINCO-5690 (5-84)

Westinghouse Idaho Nuclear Company, Inc.

UNUSUAL OCCURRENCE REPORT

Report Number: 84-16

Report Status: Initial:

Final: XXX

9. Operating conditions at time of occurrence:

Normal warehouse and supply operations.

10. Immediate evaluation:

Snow and ice buildup between pallets on the storage pad caused an uneven condition, and the forklift tine slipped between the two pallets and pierced a barrel on the back pallet.

Maintenance personnel put vermiculite on the spill to absorb and contain the liquid, but they were unable to clean up the spill because they were not trained in respirator usage and because empty barrels were not available. Environmental Monitoring and Industrial Safety personnel were consulted and (since most of the hexone had evaporated) made the decision to move the contaminated snow and ice across the road, cover the area with a tarp, and rope the area off. Ultimately, the vermiculite will be barrelled and disposed of as hazardous waste.

The hexone spill was contained in a small area of snow and ice which covered an asphalt surface, thus preventing seepage into the soil, and most of the hazard pa quickly due to evaporation.

11. Immediate corrective action taken, and results:

The spill was roped off, "no smoking" signs were posted, and warehouse personnel were instructed not to smoke as vapors were highly flammable. The Warning Communications Center was notified by Environmental Monitoring personnel, and Maintenance yardmen put vermiculite on the spill.

12. Is further evaluation of the occurrence necessary? Yes: No: XXX
Before further operation? Yes: No:

If further evaluation is necessary, by whom?

By what date is evaluation necessary?

FORM WINCO-5690 (5-84)

Westinghouse Idaho Nuclear Company, Inc.

UNUSUAL OCCURRENCE REPORT

Report Number: 84-16

Status: Initial:

Final: XXX

13. Final evaluation and lessons learned:

Barrels have been moved away from building south of cylinder dock of CPP-660. If there is an accumulation of snow, Warehouse personnel have a snow plow attachment for forklift to remove snow before moving palletized chemicals with forklift. The vermiculite was barreled and disposed of.

0045177

14. Permanent corrective action:

Taken: XXX Recommended: To be supplied:

1. Respirator training was given to Warehouse personnel on 02/16/84, which will ensure that they are able to clean up spills of this type.

2. Nuclear and Industrial Safety personnel have developed procedures to implement DOE-ID Order 5480.1A, Chapter XII, Section V, and clarify actions to be taken regarding notifications, cleanup, and disposal whenever spills of this type occur.

   Responsible personnel: K. Krivanek Completed 3/1/85

3. A snow plow attachment for forklift was purchased.

FORM WINCO-5590 (5-84)

Westinghouse Idaho Nuclear Company, Inc.

UNUSUAL OCCURRENCE REPORT

Report Number: 84-16

Report Status: Initial:

Final: XXX

15. Programmatic impact and costs:

Material cost: $210

0045177

16. Impact on codes and standards:

DOE-ID Order 5480.1A, Chapter XII, Section V.

17. Similiar Unusual Occurrence Report Numbers:

None

18. Signatures:

Donna S. Crockett — Date April 12, 1985

Donna S. Crockett, Manager, Stores

RCM — DR Kay for — Date 4-12-85

R. C. Mairson, Vice President and Manager, Production

J. J. Volpe — Date 5/7/85

J. J. Volpe, Vice President and Manager, Nuclear and Industrial Safety

Date

Date

Date

Reference 2

Golder Associates Inc.
CONSULTING ENGINEERS

REPORT FOR THE IDAHO CHEMICAL PROCESSING PLANT DRILLING AND SAMPLING PROGRAM AT LAND DISPOSAL UNIT CPP-64

REF: C86-131159, TASK 6, MOD 4

Prepared For:

EG&G Westinghouse Idaho Nuclear Company, Inc.
Idaho Falls, ID

Prepared By:

Golder Associates Inc.
Redmond/Richland, WA

January 1991

893-1195.330

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1. INTRODUCTION

1.1 Purpose and Objectives

The objectives of the sampling and analysis program conducted by Golder Associates Inc. (Golder Associates) at Land Disposal Unit (LDU) CPP-64 were to evaluate the nature and extent of soil contaminated from a hexone spill known to have occurred at the site and to determine site closure requirements. Furthermore, the program was directed at any additional hazardous constituents which may be present above action levels. This work was performed in accordance with the Technical Work Plan for the Idaho Chemical Processing Plant Drilling and Sampling Program at Land Disposal Units CPP-39, CPP-59 and CPP-64, and Solid Waste Management Units CPP-51 and CPP-54 (Golder Associates, 1990a).

1.2 Organization of the Report

This report presents general information on the site and the physical setting, a description of sampling and analysis procedures, a description of the nature and extent of the contamination, a health and environmental assessment, and a summary and conclusions. The conclusions detail our recommendations for site closure. Borehole logs are presented in Appendix A. Appendix B contains the List of Compounds Analyzed and Appendix C presents the laboratory reports from the contract laboratories.

2. SITE BACKGROUND AND PHYSICAL SETTING

2.1 Idaho Chemical Processing Plant

2.1.1 Regional Geology

The Idaho Chemical Processing Plant (ICPP) is located in the southern portion of the Idaho National Engineering Laboratory (INEL) site that covers approximately 890 square miles of the eastern Snake River Plain in southeastern Idaho (See Figure 2.0). The plain is a structural and topographic basin approximately 200 miles long and 50 to 70 miles wide. Surficial sediments range from 0 to 345 feet thick at the INEL. Underlying the surficial sediments are 2,000 to 10,000 feet of basalt flows, rhyolitic rocks, tephra, and interbedded alluvium and lacustrine deposits (Mundorff et al., 1964; Bartholomay et al., 1989; Pittman et al., 1988).

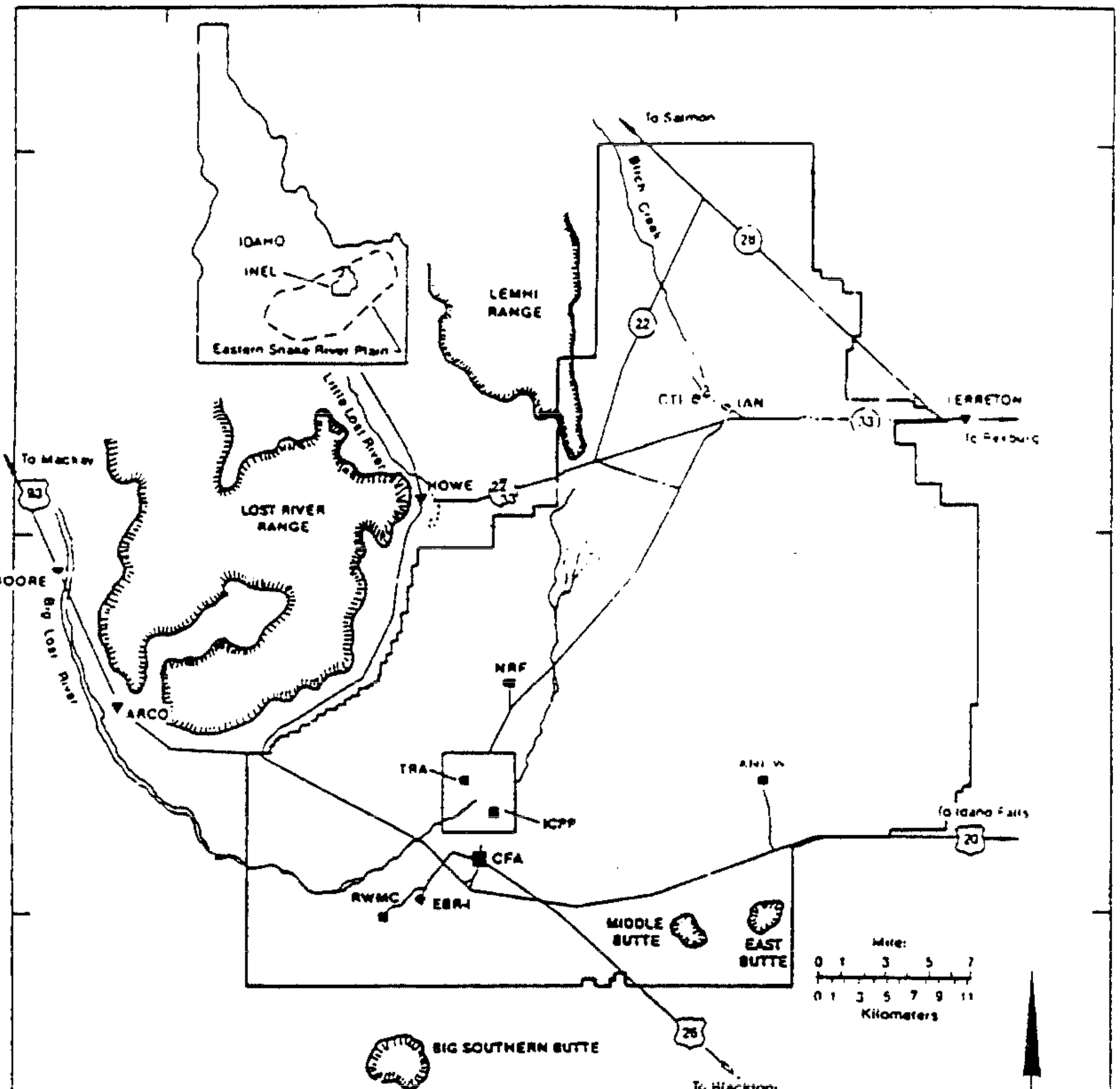
The ICPP is located on alluvial sediments deposited by the Big Lost River or on fill materials. The alluvial sediments are generally composed of sand and gravel with only traces of silt and clay. This coarse grain surficial layer is underlain by up to 10 feet of silt and clay that overlies the Snake River Plain basalts. The contact between the basalt and the overlying sediments generally occurs between 40 to 50 feet below the undisturbed land surface in the area of the ICPP (WINCO, 1989a, 1989b).

Sedimentary interbeds are common within the Snake River Plain basalts. In the area of the ICPP, a 15 to 30 foot thick clayey interbed occurs at a depth of approximately 110 feet below the land surface. The sequence of interbedded basalt and sedimentary interbeds continues well below the water table and there is some evidence of a sedimentary interbed at depth of approximately 750 feet below the land surface (WINCO, 1989a, 1989b). Sedimentary interbeds between the basalt flows are primarily composed of sand, silt, and clay-sized materials (WINCO, 1989a, 1989b). Layers containing cinders within the basalts are composed primarily of sand and gravel-sized material.

2.1.2 Regional Hydrology

Surface Water

The Big Lost River is the major surface water feature on the INEL with its headwaters located west of the site. The Big Lost River flows to the southeast past the town of Arco, Idaho onto the Snake River Plain then turns to the northeast flowing onto the INEL and terminating in three playa lakes. Where the river flows onto the plain the main channel branches into many distributaries and the flow is spread broadly, losing water by infiltration into the channel bottom (Pittman et al., 1988). The Big Lost River is ephemeral with flow onto the site only during periods of high runoff. The INEL Diversion Dam located approximately 9 miles upstream from the ICPP, was designed to control flooding on the INEL site by diverting water into designated spreading areas.



EXPLANATION

Selected Facilities at the Idaho National Engineering Laboratory

CFA	- CENTRAL FACILITIES AREA	NRF	- NAVAL REACTORS FACILITY
EBR-1	- EXPERIMENTAL BREEDER REACTOR NO. 1	RWMC	- RADIOACTIVE WASTE MANAGEMENT COMPLEX
ICPP	- IDAHO CHEMICAL PROCESSING PLANT	TAN	- TEST AREA NORTH
CTF	- CONTAINED TEST FACILITY (formerly called Loss of Fluid Test Facility--LOFT)	TRA	- TEST REACTORS AREA
▬	- INEL BOUNDARY	ANL-W	- ARGONNE NATIONAL LABORATORY-WEST
■	- FACILITIES		
▼	- TOWNS		

(after Bartholomay, et al. 1989)

FIGURE 2.0

SITE PLAN

EG&G/ICPP/10

Hydrogeology

The Snake River Plain aquifer is a vast groundwater reservoir that may contain more than 1 billion acre-feet of water (Barraclough et al. 1981). The groundwater flow direction is generally from north-northeast to the south-southwest. Groundwater flow is through intercrystalline and intergranular pores, fractures, cavities, interstitial voids, interflow zones, and lava tubes. The depth to the Snake River Plain aquifer in the area of the ICPP is approximately 455 feet below land surface based on 1990 water level measurements measured by Golder Associates Inc. The direction and rate of groundwater movement in the vicinity of the ICPP is documented from monitoring contaminant plumes in the Snake River aquifer and is consistent with the regional trend. The rate of flow ranges from 5 to 15 ft/day (Pittman et al., 1988)

Two perched groundwater zones are known to exist at the ICPP. One perched groundwater zone is located at an approximate depth of 40 feet at the contact between the surficial alluvial sediments and the uppermost Snake River Plain basalt flow. The groundwater is perched by a silty/clayey layer overlying the basalt. The second zone is located along the top of a low permeability sedimentary interbed located at approximately 110 feet below land surface.

2.2 Land Disposal Unit (LDU) CPP-64

2.2.1 Location and Description of LDU CPP-64

LDU CPP-64 is located along the west side of the ICPP facility along Birch Street between Hickory Avenue and Ponderosa Avenue (See Figure 2.1 and 2.2). LDU CPP-64 includes two zones of potential contamination. Zone 1 is a small (10 ft. x 10 ft.) asphalt paved area adjacent to Building CPP-660. Zone 2 is a small (10 ft. x 25 ft.) unpaved area located west of Birch Street.

Building CPP-660 is a chemical storage warehouse with an asphalt paved area to the west. In the past, 55 gallon drums containing supply chemicals were stored outside and adjacent to the west wall of CPP-660 (Zone 1) on pallets. On February 14, 1984, a spill of approximately 55 gallons of hexone occurred when a forklift tine punctured a drum stored in the area. The puncture was through the side of the drum, near the bottom, and about 55 gallons leaked onto the asphalt. At the time of the release, the asphalt was covered with snow and ice and the temperatures were below freezing for most of the day (35° F maximum and 20° F minimum). WINCO personnel who inspected the site saw no evidence that the hexone came in contact with the asphalt (i.e., the hexone did not penetrate the ice and snow prior to vermiculite being placed on the spill). (Sehlke, 1989)

Twenty five 3 ft^3 bags of vermiculite were used to absorb the spilled hexone. The vermiculite was spread on the area of the spill within approximately one hour of the spill. The vermiculite and snow were then pushed across Birch Street, which is paved with asphalt, onto the ground west of the street (Zone 2). The vermiculite remained on the soil

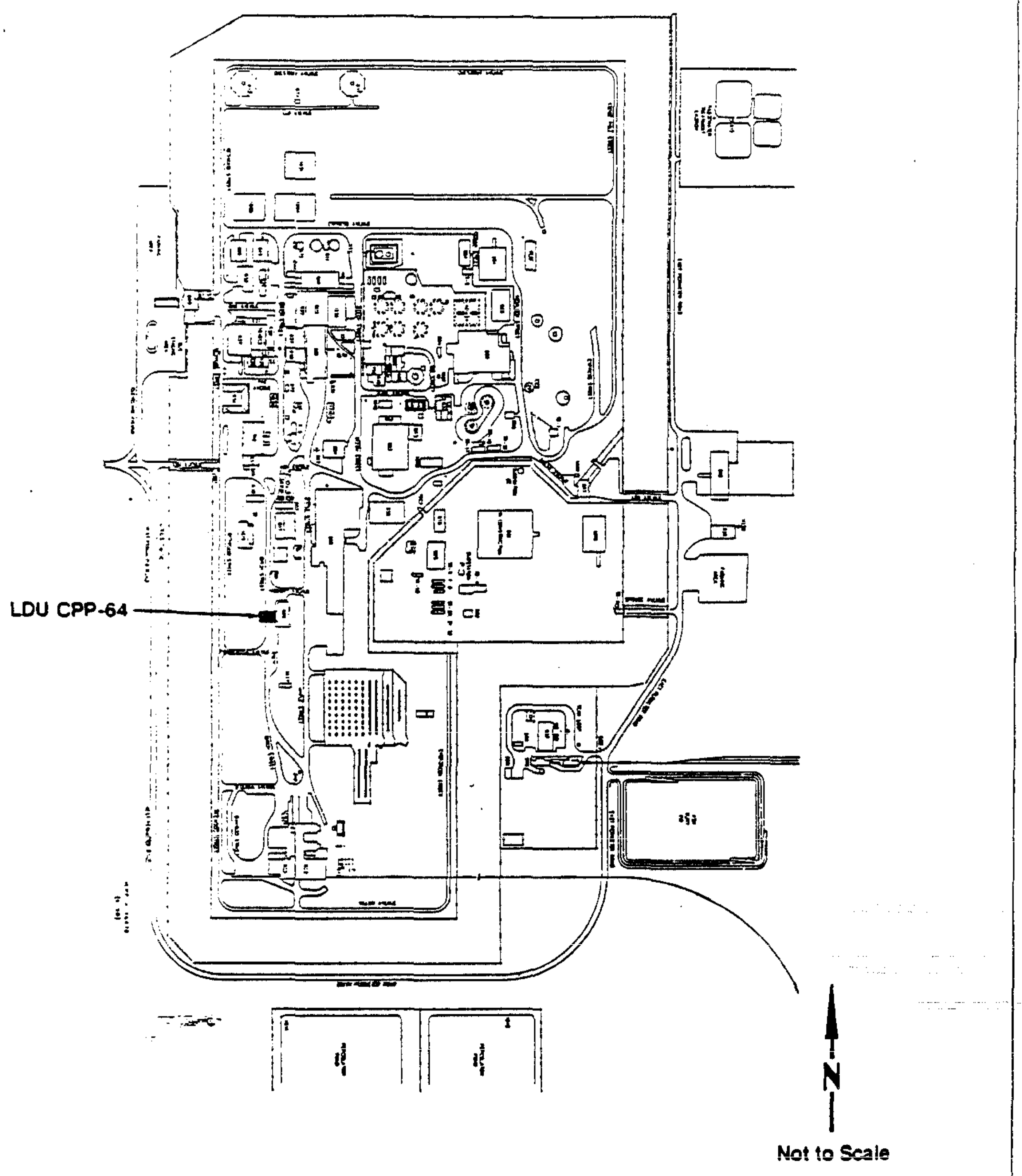


FIGURE **2.1**

SITE PLAN

IDAHO CHEMICAL PROCESSING PLANT

PROJECT NO. 893-1195.330 DWG. NO.22107 DATE 9/28/90 DRAWN DC

Golder Associates

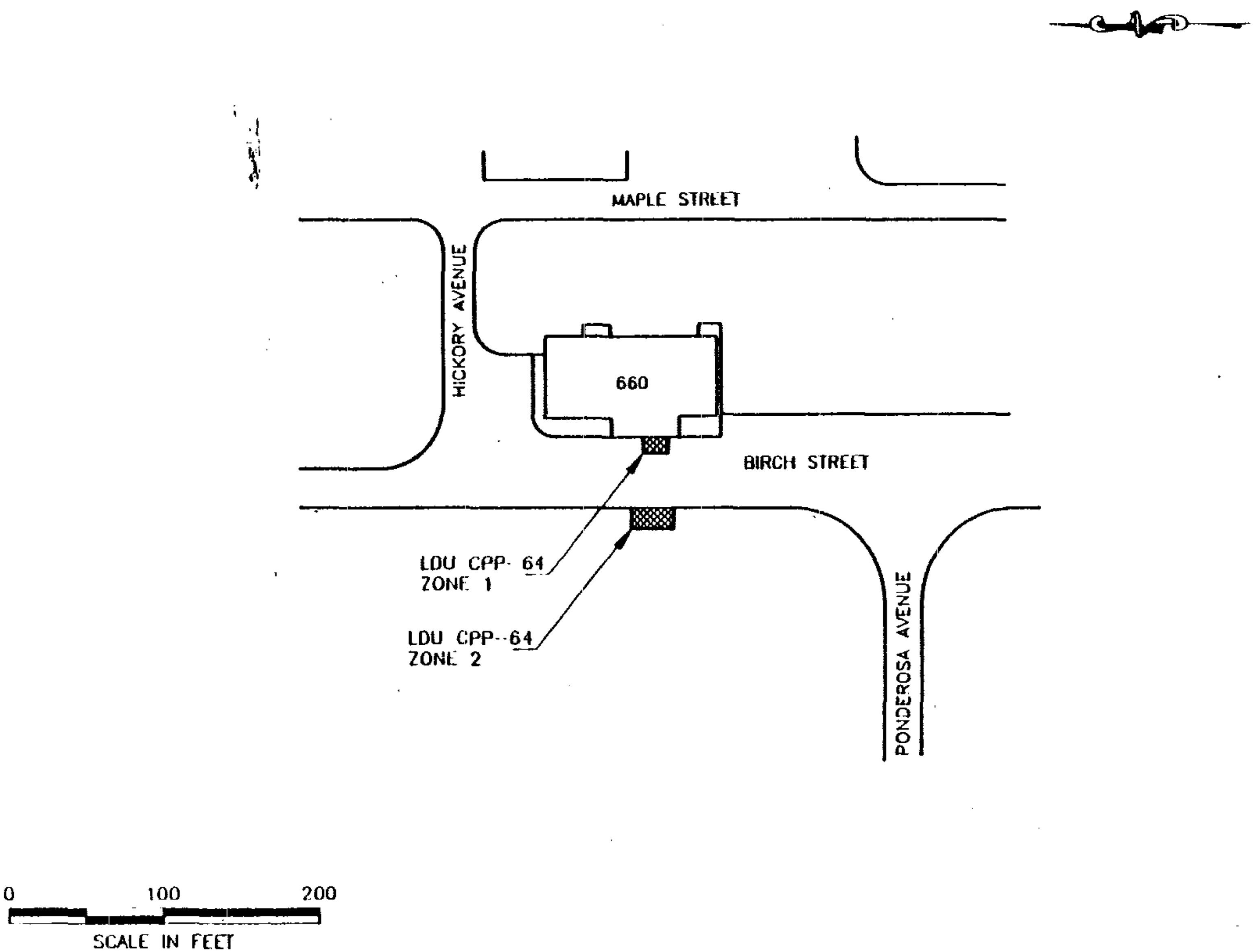


FIGURE 2-2
SITE PLAN,
LAND DISPOSAL UNIT -64
IDAHO CHEMICAL PROCES. PLANT

PROJECT N 1195.330 DWG NO 33814 DATE 7/25/90 DRAWN JSS APPROVED DPF

Golder Associates

for several days prior to being drummed and disposed of at a commercial hazardous waste disposal facility. (Sehlke, 1989)

Three weeks later, after the snow adjacent to CPP-660 melted and water evaporated, a small amount of vermiculite (approximately 3 ft^3) was discovered at the location of the spill. This material was also pushed from the spill site to Zone 2 west of birch Street using a blade on a forklift. This vermiculite covered an area about 5 ft. long and 2 ft. wide adjacent to the street and was left in place. (Sehlke, 1989)

2.2.2 Known and Suspected Wastes Associated with LDU CPP-64

Hexone is the only waste known to be associated with both Zone 1 and Zone 2 in LDU CPP-64. However, due to the fact that Zone 1 was used to store supply chemicals, a variety of other hazardous constituents may be present in that area.

3. SAMPLING AND ANALYSIS

3.1 Objectives

The objective of the sampling effort at LDU CPP-64 was to determine whether any organic solvents or miscellaneous chemicals have been released to the soil. LDU CPP-64 contains two zones as described in section 2.2.1. Zone 1 has been recently re-surfaced with asphalt and Zone 2 is a gravel surfaced area. There is currently no surface evidence of any spills or leaks in the area and hexone is the only material known to have leaked. However, a variety of organic solvents and chemicals were stored at the site. Because of the limited information regarding possible spill locations and materials a combination of soil gas survey techniques and subsurface soil sampling was conducted at LDU CPP-64.

3.2 Soil Gas Survey

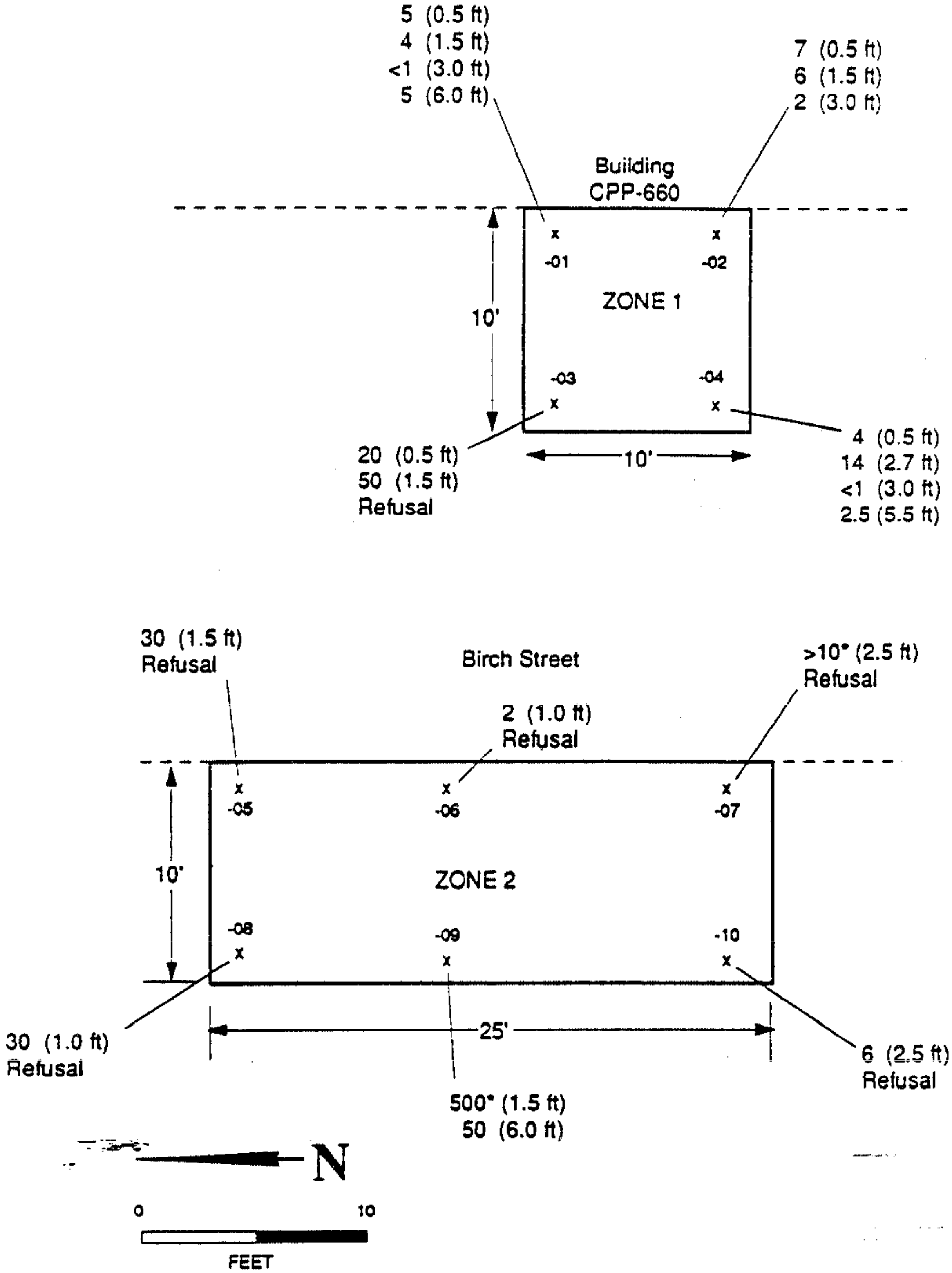
A soil gas survey was conducted at LDU CPP-64 to detect potential releases of organic solvents and select locations for soil sampling. Soil gas probes were installed in Zones 1 and 2 at the locations shown on Figure 3.0. As mentioned previously, Zone 1 has recently been paved with asphalt and required drilling with a pneumatic drill through the asphalt to gain access to the underlying soils. Soil gas samples in Zone 1 were collected directly beneath the asphalt (approximate depth of 0.5 ft.), 1.5 ft., 3.0 ft., and 6 ft or until refusal was encountered. Samples in Zone 2 were collected at 3 and 6 feet or until refusal was encountered. Soil gas samples were analyzed with a Foxboro Model 128 organic vapor analyzer (OVA).

For soil gas sampling quality control purposes, the soil gas sampling probe was tested between each sampling location with the OVA for levels above background. If measured levels were above background levels, the soil gas sampling probe was decontaminated according to the procedures specified in Section 4.6 of the Quality Assurance Project Plan (Golder Associates, 1990b). Decontamination consisted of the following procedures:

- Steam clean equipment with deionized water and wipe dry
- Wipe equipment with a clean rag soaked with methanol and allowed to air dry.
- Rinse equipment with deionized water and wipe dry with clean rag
- Store equipment in clean plastic wrapping until needed

3.3 Soil Sampling Methods and Locations

The drill rig was decontaminated prior to entering the ICPP. Decontamination consisted of high pressure steam cleaning by Hawley Brothers, the drilling subcontractor, at a WINCO-designated area. Golder Associates personnel visually inspected the drill rig and downhole



x -07 Soil gas sampling locations, results in parts per million as measured with an OVA. Sample depth in parentheses.

* Short duration maximum reading

FIGURE 3.0

SOIL GAS SURVEY LOCATIONS AT LAND DISPOSAL UNIT CPP-64

IDAHO CHEMICAL PROCESSING PLANT

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Golder Associates

tools before they were brought on site for grease, hydraulic fluid, and other visible materials that could potentially contaminate the borehole.

Soil sample locations in Zones 1 and 2 are shown on Figure 3.1. Boring locations were directed by the results of the soil gas survey. All borings were drilled to a depth of 6 feet with hollow stem augers. Sample collection intervals were 0 - 2 feet, 2 - 4 ft., and 4 - 6 ft. All samples were taken with a 2 ft. long, 4 inch O.D. split spoon drive sampler containing a lexan inner barrel and driven by a 140 pound safety hammer. The Lead Geologist recorded the number of blows required to advance the sampler in 6 inch increments. The head space within the lexan barrel containing the sample was sampled with the OVA and any readings above background were recorded. All samples were screened by a WINCO HP for radiation levels above background levels. Soil samples in Zone 1 were not collected directly beneath the asphalt because of possible matrix interference from common hazardous constituents present in asphalt.

Sampling equipment and sample preparation tools were decontaminated between each sample interval to minimize the potential for cross contamination. Drilling and sampling decontamination procedures consisted of those specified in Section 4.6 of the Technical Work Plan, Volume II (Golder Associates 1990b).

3.4 CPP-64 Site Geology

LDU CPP-64 is located on about six inches of granular fill which overlies alluvial sediments deposited by the Big Lost River. Based on the color, size gradation, and lithology, the fill material is probably derived from a nearby source and is therefore similar in composition to the undisturbed underlying alluvium.

Two six foot deep borings (CPP64-01 and CPP64-02) were drilled and sampled in Zone 1. The locations of the borings are shown of Figure 3.1. The alluvial sediments in Zone 1 generally consist of compact to dense, gravelly fine to coarse sand to silty fine to medium sand. Local thin (1 in. to 6 in. thick) beds of moist clayey silt and silty clay were encountered in CPP-64-1 at depths of 3.3 ft. and 6.3 feet. No groundwater was encountered in either of the Zone 1 borings.

Three borings were drilled and sampled in Zone 2 (CPP64-03, CPP64-04, and CPP64-05) to depths of six feet. The locations of these borings are shown on Figure 3.1. Zone 2 stratigraphy consisted of a two foot thick sandy to gravelly silt overlying fine to medium sand to gravelly ~~fine~~ to coarse sand. No groundwater was encountered in the three Zone 2 borings.

Upon completion of the drilling and sampling, a one foot thick bentonite pellet seal was placed in the bottom of each boring. Each bentonite seal was hydrated with five gallons of deionized water and the remainder of the borehole volume backfilled with WINCO-approved granular fill. The paved surfaces were then repaired with asphalt cold patch.

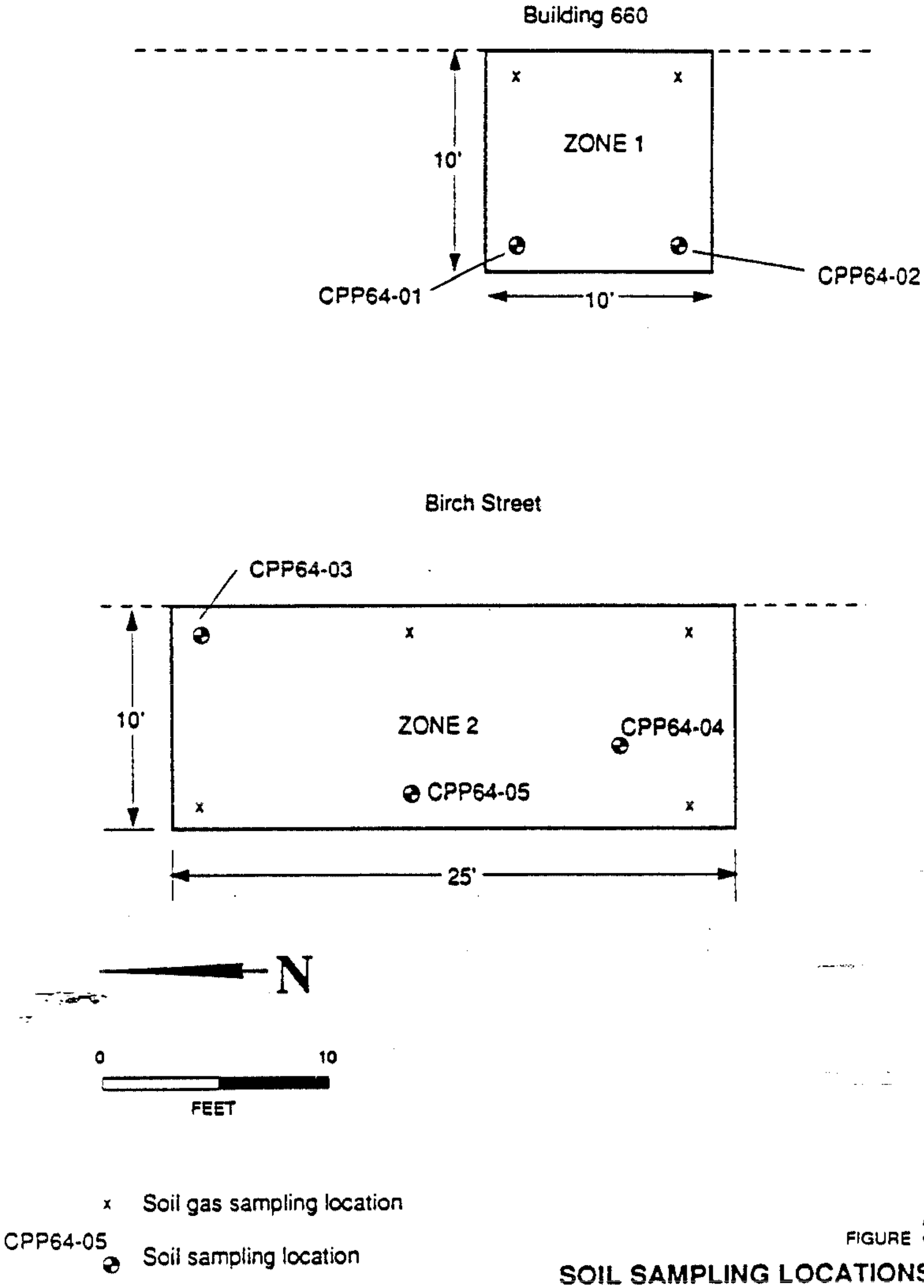

FIGURE 3.1

SOIL SAMPLING LOCATIONS AT LAND DISPOSAL UNIT CPP-64

IDAHO CHEMICAL PROCESSING PLANT

PROJECT NO. 893-1195.330 DWG. NO. 22757 DATE 7/24/90 DRAWN CB

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3.5 Sample Handling and Analysis, LDU CPP-64

Surface samples were obtained at boreholes 1 and 2 by augering through the asphalt, followed by continuous split spoon sampling at two foot intervals to the total depth of the borehole. All other boreholes were sampled by continuous split-spoon sampling at two foot intervals to the total depth of the borehole. Samples were processed by laying out a fresh length of protective plastic on the processing table. The caps on upper end of the lexan inner barrel were then removed and the upper 6 inches of sample material was discarded if the sample was collected from immediately beneath the asphalt. For all other samples the upper 2 to 4 inches of material was discarded. Grab samples for volatile organics were then immediately placed into 2 ounce glass jars. Sample were placed into the container such that little or no headspace was present, the containers were immediately sealed with a teflon lined lid and temporarily placed in a shipping container with coolant for preservation.

The remaining sample material except for the last 2 to 4 inches of the sample interval was transferred into a decontaminated stainless steel mixing bowl, mixed thoroughly using decontaminated stainless steel utensils, granular material 1 to 2 inches in size was discarded. A sub-sample of the remaining material was transferred to an 8 ounce glass sample container for semi-volatile organic analysis and into an 8 ounce plastic container for inorganic metals analysis. Any remaining sample material was discarded into a waste container for subsequent disposal by WINCO personnel. The samples were then labeled and placed into an appropriate shipping container with the necessary amount of coolant for maintaining the samples at 4°C. Samples were then transferred by overnight carrier under chain-of-custody to the analytical laboratory.

After processing each sample, all equipment was decontaminated in accordance with Section 4.6 of the Quality Assurance Project Plan (Golder Associates 1990b).

At the end of the sampling activities for each day all solid wastes generated were double packaged according to WINCO waste handling practices and removed from the site for disposal in accordance with INEL waste disposal procedures. All liquid wastes generated from the final decontamination of sampling equipment were collected in a catch basin and pumped into 55 gallon drums for disposal.

All samples obtained were analyzed at Pacific Northwest Environmental Laboratory, Inc. (PNELI) of Redmond, Washington for the constituents listed in Table 3.1 with the exception of the surface sample obtained from borehole 5. The surface to 2 foot sample collected from borehole 5 was analyzed at Gulf South Environmental Laboratory, Inc. (GSELI) of New Orleans, Louisiana and Southwest Laboratory of Oklahoma, Inc. of Tulsa, Oklahoma for the 40 CFR Part 261 Appendix VIII constituents.

Results of the analysis indicating the target compounds detected and the range of values are presented in Table 3.2. Copies of all laboratory data reports are provided in Appendix C. A discussion of the analytical results is presented in Section 4.

Table 3.1

Target Compound/Analyte List
Land Disposal Unit CPP-55

Compound/Analyte	Compound/Analyte	Compound/Analyte
<u>Volatile Organics</u>	<u>Inorganic Metals</u>	<u>Semivolatile Organics</u>
Chloromethane	Arsenic	(Cont.)
Bromomethane	Barium	Dimethylphthalate
Vinyl Chloride	Cadmium	Acenaphthylene
Chloroethane	Chromium	2,6-Dinitrotoluene
Methylene Chloride	Iron	3-Nitroaniline
Acetone	Lead	Acenaphthene
Carbon Disulfide	Mercury	2,4-Dinitrophenol
1,1-Dichloroethene	Nickel	4-Nitrophenol
1,1-Dichloroethane	Selenium	Dibenzofuran
1,2-Dichloroethene (total)	Silver	2,4-Dinitrotoluene
Chloroform		Diethylphthalate
1,2-Dichloroethane	<u>Semivolatile Organics</u>	4-Chlorophenyl-
2-Butanone	Phenol	phenylether
1,1,1-Trichloroethane	bis(2-Chloroethyl)ether	Fluorene
Carbon Tetrachloride	2-Chlorophenol	4-Nitroaniline
Vinyl Acetate	1,3-Dichlorobenzene	4,6-Dinitro-2-methylether
Bromodichloromethane	1,4-Dichlorobenzene	N-Nitrosodiphenylamine
1,2-Dichloropropane	Benzyl alcohol	4-Bromophenyl-
cis-1,3-Dichloropropene	1,2-Dichlorobenzene	phenylether
Trichloroethene	2-Methylphenol	Hexachlorobenzene
Dibromochloromethane	bis(2-Chloroisopropyl)ether	Pentachlorophenol
1,1,2-Trichloroethane	4-Methylphenol	Phenanthrene
Benzene	N-Nitroso-di-n-propylamine	Anthracene
trans-1,3-Dichloropropene	Hexachloroethane	Di-n-butylphthalate
Bromoform	Nitrobenzene	Fluoranthene
4-Methyl-2-pentanone	Isophorone	Pyrene
2-Hexanone	2-Nitrophenol	Butylbenzylphthalate
Tetrachloroethene	2,4-Dimethylphenol	3,3'-Dichlorobenzidine
Toluene	Benzoic Acid	Benzo(a)anthracene
1,1,2,2-Tetrachloroethane	bis(2-Chloroethoxy)methane	bis(2-Ethylhexyl)phthalate
Chlorobenzene	2,4-Dichlorophenol	Chrysene
Ethyl Benzene	1,2,4-Trichlorobenzene	Di-n-octylphthalate
Styrene	Naphthalene	Benzo(b)fluoranthene
Xylenes (total)	4-Chloro-3-methylphenol	Benzo(k)fluoranthene
	2-Methylnaphthalene	Benzo(a)pyrene
	Hexachlorocyclopentadiene	Indeno(1,2,3-cd)pyrene
	2,4,6-Trichlorophenol	Dibenz(a,h)anthracene
	2,4,5-Trichlorophenol	Benzo(g,h,i)perylene
	2-Chloronaphthalene	
	2-Nitroaniline	

Table 3.2

Detected Inorganic and Organic Analytes and Compounds
Land Disposal Unit CPP-64

Analyte Compound	Range of Detected Values
Detected Inorganic Analytes	mg/Kg
Aluminum	5,120
Antimony	11.7
Arsenic	2.5 - 7.1
Barium	30.8 - 235
Beryllium	0.55
Calcium	39,200
Chromium	8.8 - 22.4
Cobalt	5.1
Copper	17.3
Iron	7,260 - 18,000
Lead	4.9 - 41.3
Magnesium	6,210
Manganese	278
Mercury	<0.09 - 0.12
Nickel	12.0 - 28.4
Potassium	1,270
Selenium	<0.60 - 0.78
Silver	<2.1 - 1.1
Sodium	262
Vanadium	14.9
Zinc	54.4
Detected Organic Compounds	µg/Kg
Ethylbenzene	23
Toluene	4
Xylenes	100
Unknown Volatile Compounds	7.1 - 17
Benzo(a)anthracene	75
Bis(2-ethylhexyl)phthalate	69 - 1,500
Butylbenzylphthalate	240 - 610
Chrysene	100 - 120
Diethylphthalate	200 - 1,900
Di-n-butylphthalate	490 - 2,200
Unknown Semivolatile Organic Compounds	280 - 3,400

[1]Where single values are shown the analyte or compound was only detected in one sample.

3.6 Quality Assurance/Quality Control

Quality assurance/quality control procedures were implemented during the sampling and analysis program. These procedures are summarized below.

- Trip blank and equipment blank samples were collected and analyzed to monitor of potential contamination that may have been introduced from the decontamination procedures and shipping process.

- Field duplicate samples were collected to measure overall field and laboratory precision.

- Blind reference performance audit samples were prepared and submitted for analysis for selected volatile organics, semivolatile organics and trace metals to determine laboratory accuracy.

- A systems audit was conducted at the sampling site during routine sample collection activities.

3.6.1 Blanks

Trip blanks were submitted for volatile organic analysis in all sample shuttles. Acetone (49 to 58 µg/L) and methylene chloride (6 µg/L) were detected in the trip blank samples submitted but these compounds were also detected in the laboratory method blanks at similar concentrations.

Equipment blank samples were submitted for one sampling round. The blanks were prepared by decontaminating the sample processing equipment as described in Section 4.6 of the Quality Assurance Project Plan (Golder Associates, 1990b), followed by a final rinse with deionized water and collection of the rinseate in the proper containers for volatile organic, semivolatile organic and inorganic analysis. Iron was detected at 51.6 µg/L. Iron is common in the alloys used for fabrication of drilling and sampling equipment. This concentration is well below the concentrations (7,260 to 18,000 mg/Kg) detected in the soil samples collected at the site. Four unknown semivolatile organic compounds were detected at concentrations ranging from 7.8 to 100 µg/L. These unknown semivolatile organic compounds were also detected in the associated aqueous laboratory method blanks at similar concentrations ranging from 20 to 110 µg/L.

3.6.2 Field Duplicates

Field duplicate sample analysis results from LDU CPP-64 are presented in Table 3.3 The samples were collected and prepared as described in Section 3.5. The table presents the relative percent difference (RPD) between duplicate samples for analyses that exhibit results greater than the sample detection limit. Although no data quality criteria exist for field duplicates, the EPA recommends that the RPD for laboratory duplicates fall within a control

Table 3.3

Field Duplicate Analysis Results
Land Disposal Unit CPP-64

Golder Sample ID:	CPP64-05-TX-3-2 CPP64-04-V2-3-2 CPP64-05-SV2-3-2	CPP64-05-TX-3-2-D CPP64-04-V2-3-2-D CPP64-05-SV2-3-2-D	Relative Percent Difference RPD
Date Sampled:	6/14/90	6/14/90	
Inorganic Analytes (Results in mg/Kg)			
Arsenic	4.2	6.8	47.3
Barium	102	88.3	14.4
Cadmium	<1.3	<1.1	NC
Chromium	11.6	20.9	57.2
Iron	10,100	10,400	2.9
Lead	9.3	5.3	54.8
Mercury	<0.12	<0.1	NC
Nickel	21.7	22.6	4.1
Selenium	<0.78	<0.63	NC
Silver	<2.6	<2.2	NC
Organic Compounds (Results in µg/Kg)			
Acetone	10 J	<11	NC
Chloroform	6	<6	NC
Di-n-butylphthalate	1,100	2,200	66.7
Butylbenzylphthalate	520 J	240 J	73.7
bis(2-Ethylhexyl)phthalate	1,500	230 J	147
Unknown semivolatile organic compounds	8,780	7,810	11.7

RPD - relative percent difference is calculated by taking the absolute value of the difference between two measurements divided by the average of the two measurements, multiplied by 100.

NC - the result(s) is not calculable due to one or both of the measurements at or below the sample detection limit or not detected.

J - the particular compound was detected at a concentration below the contract required detection limit.

limit of $\pm 20\%$ for water samples and $\pm 35\%$ for soils when sample values are 5 times the sample detection limit (EPA, 1988a).

The results for arsenic, chromium, lead, di-n-butylphthalate, butylbenzylphthalate and bis(2-Ethyhexyl) phthalate exceeded the $\pm 35\%$ control limit, but this is indicative of the heterogeneity of soil matrices in general. All other results were within the control limits.

3.6.3 Performance Audit Samples

Blind reference samples were prepared and submitted for analysis and the results are presented in Table 3.4. The samples were prepared by spiking laboratory prepared deionized water with a quality control reference sample obtained from the U.S. EPA Environmental Monitoring and Support Laboratory in Cincinnati, Ohio. All the sample analysis results submitted from the laboratories were within the EPA defined control limits for each parameter of interest.

3.6.4 Sample Collection Systems Audit

A systems audit was conducted by Golder Associates Inc. personnel during the period of June 20-22, 1990. Minor corrective actions were required, which were completed and accepted. None of the required corrective actions affected the integrity of the samples collected.

3.6.5 Laboratory Systems Audit

A systems audit was performed at the Gulf South Environmental Laboratory and Southwest Laboratory of Oklahoma on August 28 and 29, 1990, respectively. The audit was performed by Golder Associates Inc. personnel and observed by WINCO representatives. Both audits resulted in corrective action requests to the laboratory to monitor sample storage temperatures more closely and to maintain better traceability of calibration materials. None of the corrective actions affected the integrity of the samples or the validity of the data.

3.7 Data Validation

All sample analysis results were reviewed and validated in accordance with Section 8 of the Technical Work Plan and with the EPA data validation guidelines (EPA 1988a and EPA 1988b).

All soil samples to be analyzed for volatile organics were analyzed within 7 to 14 days. Other critical holding time sensitive sample parameters such as mercury were analyzed within the required 28 days.

Table 3.4
Performance Audit Sample Analysis Results

Land Disposal Unit CPP-64

Laboratory Sample ID: 2520-03; -01
Golder Sample ID: CPP545964-V2-FS; -V3-FS
Date Sampled: 6/26/90

Compound/Analyte	Reported Value µg/L	True Value µg/L	Percent Recovery	Control Limits 1) 2)
Volatile				
Methylene Chloride	23	20.8	111	1-221
1,1-Dichloroethane	19	20	95	1-234
Chloroform	20	20.2	99	51-138
1,1,1-Trichloroethane	16	20.2	79	52-162
Bromodichloromethane	18	20.2	89	35-155
Trichloroethene	19	20.4	93	71-157
Dibromochloromethane	17	20.4	83	53-149
Benzene	20	20.6	97	37-151
Bromoform	14	20	70	45-169
1,1,2,2-Tetrachloroethane	16	20	80	46-157
Toluene	19	20.6	92	47-150
Semivolatile				
Bis(2-chloroethyl)ether	72	100	72	12-158
1,3-Dichlorobenzene	73	100	73	0-172
1,2-Dichlorobenzene	77	100	77	32-129
Nitrosodi-n-propylamine	75	100	75	0-230
Isophorone	80	100	80	21-196
Bis(2--Chloroethoxy)methane	79	100	79	33-184
1,2,4-Trichlorobenzene	78	100	78	44-142
Hexachlorobutadiene	76	100	76	24-116
2-Chloronaphthalene	81	100	81	60-118
2,6-Dinitrotoluene	73	100	73	50-158
2,4-Dinitrotoluene	72	100	72	39-139
Diethylphthalate	39	100	39	0-114
Hexachlorobenzene	65	100	65	0-152
Phenanthrene	70	100	70	54-120
Di-n-butylphthalate	39	100	39	1-118
Pyrene	74	100	74	53-115
Benzo(a)antracene	74	100	74	33-143
Di-n-octylphthalate	69	100	69	4-146
Benzo(k)fluoranthene	76	100	76	11-162
Metals				
Arsenic	109	100	109	75-125
Barium	99.7	100	99.7	75-125
Cadmium	101	100	101	75-125
Chromium	97.4	100	97.4	75-125
Lead	99.1	100	99.1	75-125
Mercury	77.6	100	77.6	75-125
Selenium	118	100	118	75-125
Silver	97	100	97	75-125

1) Control Limits for Organic Compounds: U.S. EPA Environmental Monitoring and Support Laboratory - Cincinnati

2) Control Limits for Inorganic Compounds: EPA, 1988a

A few volatile organic compounds were detected in some of the soil samples. These consisted of 2-butanone, acetone, ethylbenzene, methylene chloride, toluene and xylene. 2-Butanone, acetone and methylene chloride are common laboratory contaminants and they were eliminated from consideration due to their presence in the associated laboratory and field blanks in accordance with criteria and rationale specified in the data validation guidelines (EPA 1988b). Additionally, several unidentified organic compounds were detected in the samples ranging in concentration from 6.5 to 1,300 µg/Kg. These consisted primarily of unknown hydrocarbons and many were eliminated from consideration when compared to the associated blanks. Finally the concentrations of remaining valid unknown compounds were summed for each sample and the results are presented in Section 4.

Several semivolatile organic compounds were detected in the soil samples. These consisted of benzo(a)anthracene, bis(2-ethylhexyl)phthalate, butylbenzylphthalate, chrysene, diethylphthalate and di-n-butylphthalate. All results for these compounds were deemed valid when compared to associated quality control data. Additionally, several unidentified semivolatile organic compounds were detected in the samples. These consisted of unknown hydrocarbons and aldol reaction products of acetone. All the aldol reaction products were eliminated from consideration in accordance with the data validation guidelines. Many of the unknown hydrocarbons were eliminated from consideration due to their presence in associated blanks. Finally, the concentrations of remaining valid unknown compounds were totaled for each sample; the results are presented in Section 4.

Results presented in Section 4 may differ from the laboratory data presented in the appendices. This is due to the fact that when compounds found in the samples are also found in associated field and laboratory blanks the sample results are qualified as non-detects.

4. NATURE AND EXTENT OF CONTAMINATION

4.1 Assessment of Background Data

Background data for metal concentrations in soils at the ICPP were obtained by the University of Utah Research Institute (UURI) during two studies conducted in 1986 and 1987. Background soils data were obtained at four locations outside the ICPP during an investigation of the Fuel Processing Restoration (FPR) Warehouse Site in 1986. According to the Quality Assurance Sampling Plan (QASP) for this study, background subsurface soils collected were to be geologically identical to soils in the FPR site sampling area. The QASP indicated the FPR site soils were to be sampled at depths of 6 inches below the pre-fill surface of the area and at 18-24 inches below the top of the first horizon sampled. The actual depth interval sampled for background soils is not noted in the QASP or the final report of the investigation (UURI 1986a and UURI 1986b).

In 1987 background data were obtained at three locations outside the ICPP during an investigation of the Chemical Feed and Zirconium Feed Tank Storage Areas. Samples were obtained at 0-4 inches and at 24 inches at these locations for a total of six samples (UURI 1987a and UURI 1987b).

A summary of the background data obtained from the UURI investigations is provided in Table 4.1. Also shown on this table are the one-sided upper tolerance intervals (UTL) for the background data assuming a normal distribution with 95% coverage of the samples at a 95% confidence coefficient. Tolerance intervals establish a concentration range that is constructed to contain a specified proportion or coverage (P%) of the population with a specified confidence coefficient, Y (EPA 1989a).

There are potential limitations that should be considered in the use of the data obtained by UURI for determining action levels based on background concentrations. These limitations include the following:

- All UURI background data were obtained in the shallow surface soils (0-24 inches) and may not be representative of other soil types or horizons;
- Many areas of the ICPP have been graded and/or filled. Background soils sampled by UURI may not be representative of soils used for fill at the ICPP; and
- There may be widespread elevated concentrations of certain constituents above natural background at the ICPP from both point and non-point sources as a result of site activities. It is not appropriate to establish action levels for LDUs based on natural background if there are widespread elevated concentrations of constituents at the ICPP unrelated to releases from the LDUs.

Table 4.1

Background Concentrations of Metals
in Soils Sampled from Outside the ICPP Facility and
One-Sided Normal Tolerance Intervals(1)

Results in PPM								
Sample	Arsenic	Barium	Cadmium	Chromium	Lead (2)	Mercury	Selenium	Silver
Bkg 1	5.6	200	<5	25	12	0.043	0.484	<2
Bkg 2	5.1	270	<5	32	16	0.019	0.405	<2
Bkg 3	6.5	270	<5	33	17	0.027	0.467	<2
Bkg 4	7	250	<5	34	12	0.028	0.341	<2
258	5.6	280	<5	28	<10	0.025	0.113	<2
259	7.6	380	<5	26	<10	0.057	0.252	<2
260	6.4	240	<5	28	<10	0.023	0.695	<2
261	6.2	220	<5	18	<10	0.03	0.236	<2
264	6	230	<5	28	<10	0.021	0.102	<2
265	7.6	210	<5	20	<10	0.046	0.227	<2
Average ($\bar{x}$) Std. Dev. (SD) Background UTL	6.4 0.8 8.7	255 51 403	<5 -- --	27 5 42	9 5 24	0.032 0.013 0.070	0.332 0.184 0.868	<2 -- --

1. All samples were collected by the University of Utah Research Institute, Salt Lake City, UT using EPA methods. Samples Bkg 1-4 were collected for the FPR Warehouse Site, and 258-265 were collected for the Chemical Storage and Zirconium Feed Tank Storage Areas. All analyses are total constituent analyses and are reported on a dry weight basis.

2. Where lead values are listed below detection limit a value of one-half the detection limit was used in the calculation of the average, standard deviation and tolerance limit values.

3. The background one-sided upper tolerance interval (UTL) is ($\bar{x}$) + K*SD, where the K value (tolerance factor) for sample size n = 10 is equal to 2.911 with a probability level y = 0.95 and coverage P = 95%.

4.2 Results of the Soil Gas Survey

The soil gas survey was conducted as discussed in section 3.2. Measured atmospheric background levels ranged from between 0 to 1 ppm as measured with the Foxboro Model 128 organic vapor analyzer (OVA). The highest measured OVA readings in Zone 1 were at locations -03 and -04 (see Figure 3.0) where 50 ppm and 14 ppm, respectively were measured. The remainder of the test locations in Zone 1 were less than 10 ppm. The highest level measured in Zone 2 was a short duration elevated reading of 500 ppm at a depth of 1.5 ft below ground surface. This reading dropped to 50 ppm within 2 minutes and was still dropping when the test was terminated after 3 minutes. Sample locations -05 and -08 were selected for drilling and sampling because of slightly elevated readings of 30 ppm. The remainder of the soil gas sample locations in Zone 2 measured 10 ppm or less. The results of the soil gas survey are shown on Figure 3.0 and are presented on Table 4.2.

4.3 Results of Inorganic Analyses

The complete list and range of concentrations for inorganics detected at LDU CPP-64 is presented in Table 3.2. Sample results for selected inorganic analyses from the shallow borings at LDU CPP-64 are shown in Table 4.3 Also shown on this table are the upper tolerance limits (UTL) for the background soils described in Section 4.1. Lead and mercury exceeded the background UTL in one sample.

Lead was detected at concentrations exceeding the background UTL in one sample, at borehole CPP64-05 at the surface to 2 foot interval. Mercury was detected at concentrations exceeding the background UTL also in only one sample, at borehole CPP64-02 at the surface to 2 foot interval.

4.4 Results of Organic Analyses

Nine organic constituents were detected in the validated organic results from LDU CPP-64, and the results are presented in Table 4.4.

Volatile organics detected included ethylbenzene, toluene and xylenes. Ethylbenzene, toluene and xylenes were detected in boring CPP64-02 at 2-4 feet at concentrations of 23, 4 and 100 µg/Kg respectively. The concentration of toluene detected was below the sample quantitation limit. Benzo(a)anthracene was detected at boring CPP64-02 at 0-2 feet at 75 µg/Kg which was below the routine sample quantitation limit of 690 µg/Kg. Chrysene was detected at concentrations of 120 and 100 µg/Kg in boring CPP64-02 at 0-2 and 2-4 feet respectively. These concentrations also are below the routine laboratory sample quantitation limit of 690 µg/Kg.

The concentration of the phthalate esters detected ranged from below the sample quantitations limit (690 μg/Kg) to a high of 2,000 μg/Kg. Phthalate esters are recognized as common laboratory contaminants and may be attributable to laboratory handling. Bis(2-ethylhexyl)phthalate was detected in samples from all the borings at concentrations ranging from 69 μg/Kg to 1,500 μg/Kg, but there is no apparent correlation between sample concentration and depth. Butylbenzyl phthalate was detected in boring CPP64-04 at concentrations of 610 and 350 μg/Kg at the 0-2 and 4-6 foot depths, in boring CPP64-05 at 520 and 300 μg/Kg at the 2-4 and 4-6 foot depths, and in boring CPP 64-03 at 350 μg/kg at the 2-4 foot depth. Diethylphthalate was detected at boring CPP64-01 at all three sampling depths ranging from 200 to 1900 μg/Kg.

Di-n-butyl phthalate was detected in boring CPP64-03 at 2-4 feet (490 μg/Kg), in boring CPP64-04 at 0-2 (2,000 μg/Kg), 2-4 (730 μg/Kg) and 4-6 (1,300 μg/Kg) and in boring CPP64-05 at 2-4 feet (1,100 μg/Kg) and 4-6 feet (510 μg/Kg).

Several unidentified organic compounds were detected at all sampling depths in the borings ranging in concentration from 7.5 to 12,950 μg/Kg. These compounds consisted primarily of unknown alkanes and unknown alkylated benzene compounds that the laboratory could not identify.

Table 4.2

Soil Gas Survey Results
at ICPP Land Disposal Unit CPP-64

Zone	Hole	Depth (ft.)	Measurement (ppm)
1	01	0.5	5
1	01	1.5	4
1	01	3.0	<1
1	01	6.0	5
1	02	0.5	7
1	02	1.5	6
1	02	3.0	2
1	03	0.5	20
1	03	1.5	50
1	04	0.5	>10*
1	04	2.7	14
1	04	3.0	<1
1	04	5.5	2.5
2	05	1.5	30
2	06	1.0	2
2	07	2.5	>10*
2	08	1.0	30
2	09	1.5	500*
2	10	2.5	6

Notes:

1. The soil gas survey was conducted on June 6 and 7, 1990.
2. Measurements were obtained with a Foxboro Century 128 GC Organic Vapor Analyzer.
3. Sample locations are shown on Figure 3.0
4. Reported depths are below ground surface.

* Short duration OVA reading.

Table 4.3

Inorganic Sample Analysis Results
Land Disposal Unit CPP-64
(Results in mg/Kg)

Borehole	Depth	Arsenic	Barium	Cadmium	Chromium	Iron	Lead	Mercury	Nickel	Selenium	Silver
CPP64-01	0-2	4.7	126	1.1 U	16.1	13,500	11.2	0.1 U	19.0	0.64 U	2.2 U
	2-4	5.7	145	1.2 U	14.7	11,400	10.1	0.11 U	20.2	0.68 U	2.3 U
	4-6	3.3	44.9	1.0 U	10.9	8,840	17.7	0.10 U	16.2	0.61 U	2.1 U
CPP64-02	0-2	4.4	106	1.1 U	13.6	11,800	12.6	0.12	20.2	0.67 U	2.2 U
	2-4	3.2	235	1.2 U	21.3	18,000	14.1	0.12 U	28.4	0.70 U	2.4 U
	4-6	4.1	30.8	1.0 U	11.0	7,720	4.9	0.09 U	12.6	0.63 U	2.1 U
CPP64-03	0-2	7.1	205	1.2 U	20.9	15,300	18.0	0.10 U	25.5	0.68 U	2.3 U
	2-4	5.3	144	1.2 U	15.1	11,700	10.0	0.11 U	20.9	0.70 U	2.4 U
	4-6	4.0	65.1	1.1 U	12.2	9,900	5.4	0.09 U	14.8	0.61 U	2.1 U
CPP64-04	0-2	3.5	202	1.1 U	22.4	13,600	12.7	0.10 U	23.1	0.67 U	2.2 U
	2-4	3.1	71.5	1.1 U	8.8	7,260	5.2	0.09 U	12.0	0.60 U	2.1 U
	4-6	2.5	62.9	1.1 U	9.6	7,310	5.2	0.10 U	12.6	0.67 U	2.2 U
CPP64-05	0-2	3.4	154	0.37 U	12.2	9,620	41.3	0.10 U	18.5	0.78 U	1.1 U
	2-4	4.2	102	1.3 U	11.6	10,000	9.3	0.12 U	21.7	0.78 U	2.6 U
	4-6	5.6	58.3	1.1 U	10.2	8,400	6.6	0.11 U	13.4	0.65 U	2.1 U
Maximum Value		7.1	235	N/A	22.4	18,000	41.3	0.12	28.4	N/A	N/A
Minimum Value		2.5	30.8	N/A	8.8	7,260	4.9	N/A	12.0	N/A	N/A
Detection Limit		2.0	40	1.0	2.0	20	1.0	0.09	8.0	0.60	2.0
Background UTL		8.7	403	5.0	42.0	N/A	24.0	0.07	N/A	0.9	2.0

U - compound was analyzed for but not detected, the reported value is the sample detection limit.
N/A - Not applicable.

Table 4.4

Organic Sample Analysis Results
Land Disposal Unit CPP-64
(Results in µg/Kg)

Borehole	Depth	Ethylbenzene	Toluene	Xylenes	Benzo(a) anthracene	Bis(2-ethylhexyl) phthalate	Butylbenzyl phthalate	Chrysene	Diethyl phthalate	Di-n-butyl phthalate	Unknown Volatile Compounds	Unknown Semivolatile Compounds
CPP64-01	0-2	5 U	5 U	5 U	730 U	730 U	730 U	730 U	200 J	730 U	ND	7,230 J
	2-4	6 U	6 U	6 U	710 U	120 J	710 U	710 U	980	710 U	ND	1,150 J
	4-6	5 U	5 U	5 U	690 U	690 U	690 U	690 U	1900	690 U	ND	630 J
CPP64-02	0-2	5 U	5 U	5 U	75 J	720 U	720 U	120 J	720 U	720 U	ND	7,560 J
	2-4	23	4 J	100	720 U	720 U	720 U	100 J	720 U	720 U	99J	5,870 J
	4-6	5 U	5 U	5 U	690 U	69 J	690 U	690 U	690 U	690 U	ND	ND
CPP64-03	0-2	5 U	5 U	5 U	750 U	160 J	750 U	750 U	750 U	750 U	7.5 J	3,340 J
	2-4	6 U	6 U	6 U	770 U	1,000	350 J	770 U	770 U	490 J	ND	850 J
	4-6	6 U	6 U	6 U	690 U	690 U	690 U	690 U	690 U	690 U	ND	1,930 J
CPP64-04	0-2	6 U	6 U	6 U	800 U	1100	610 J	800 U	800 U	2,000	ND	12,950 J
	2-4	6 U	6 U	6 U	690 U	690 U	690 U	690 U	690 U	730	ND	6,020 J
	4-6	6 U	6 U	6 U	690 U	540 J	350 J	690 U	690 U	1,300	ND	7,470 J
CPP64-05	0-2	5 U	5 U	5 U	370 U	370 U	370 U	370 U	370 U	370 U	ND	ND
	2-4	6 U	6 U	6 U	710 U	1,500	520 J	710 U	710 U	1,100	ND	8,780 J
	4-6	5 U	5 U	5 U	690 U	560 J	300 J	690 U	690 U	510 J	ND	690 J
Maximum Value		23	4 J	100	75 J	1,500	610 J	120 J	1,900	2,000	99 J	12,950 J
Minimum Value		N/A	N/A	N/A	N/A	69 J	300 J	100 J	200 J	490 J	7.5 J	630 J
Detection Limit		5	5	5	370	370	300 J	370	370	370	N/A	N/A

U - Compound was analyzed for but not detected, the reported value is the sample detection limit.
J - Compound concentration is estimated and the result is less than the sample detection limit but greater than zero or the concentration based on a 1:1 response with the nearest internal standard.
ND - Not detected.
N/A - Not applicable.

5. HEALTH AND ENVIRONMENTAL ASSESSMENT

The Health and Environmental Assessment (HEA) is conducted to evaluate the impact of hazardous constituents present at a site. The HEA involves identifying the contaminants of concern, the concentrations of these compounds in the affected environmental media, and the exposed or potentially exposed human or environmental receptors. The essential element of this assessment is the development of an appropriate set of health and environmental criteria to which the measured or predicted concentrations of toxic contaminants are compared. These criteria are primarily based on EPA-established chronic exposure limits. When the criteria are exceeded, there is a likelihood of adverse health or environmental effects and additional measures may be required to prevent or reduce these effects.

5.1 Identification of Toxic Contaminants

Analyses of soil samples from shallow boreholes at LDU CPP-64 were conducted to determine the presence and concentration of inorganics (ten metals) and organics present in the soil. The target compound/analyte list was presented in Table 3.1. The results of the inorganic analysis results are presented in Table 4.3 Eight of the analytes are not included in this HEA. Arsenic, barium, cadmium, chromium, selenium, and silver did not exceed background concentrations or were analyzed for but not detected at the given detection limit. Iron is an essential element for humans that is generally considered non-toxic except under conditions of large, single, and accidental ingestion of medicine or in the presence of specific genetic or medical conditions. Nickel may also be essential to humans. Median soil concentrations of nickel are typically 26 - 50 mg/kg (ATSDR, 1988). The highest concentration of nickel detected was 28.4 mg/kg.

Lead is a well-documented cumulative toxin that has been shown to produce cancer based on studies in animals. Differences between individuals such as age, nutritional status, and other factors can influence the dose at which lead is toxic. Children, for example, are considered a sensitive population because they are particularly susceptible to neurological changes with excess lead intake. Because some of the toxic effects can occur at blood lead levels so low as to be essentially without a threshold, the EPA recommends that neither a chronic reference dose or a numerical cancer risk be used (EPA 1990b). Although the soil lead concentration of 41.3 mg/kg at LDU CPP-64 exceeds the background UTL, this concentration is significantly less than the soil concentration of > 500 mg/kg determined necessary to produce an increase in blood lead levels in children exposed to lead containing soil. Therefore, lead is not considered further in this HEA.

The remaining analyte, mercury, is present at a level greater than background and exposure to this compound has been associated with toxic effects. Mercury is included in the HEA for LDU CPP-64. This element has a number of inorganic and organic derivatives. Toxicity is highly dependent on the form and route of exposure, organic (alkyl) mercury being more toxic by ingestion than inorganic (metallic) mercury. Target organs for toxic effects are the central nervous system and the kidney. Mercury has not been classified as to human carcinogenicity.

Analysis results for organics found in soils at LDU CPP-64 are provided in Table 4.4. Nine compounds were specifically detected in the soil samples in addition to unknown volatile and semivolatile compounds. Although a known release of hexone occurred in Zone 1 and hexone contaminated vermiculite was stored at Zone 2, no hexone was detected in the soil samples. Of the nine organic chemicals detected, three (benzo(a)anthracene, chrysene, and bis-(2-ethylhexyl)phthalate) are probable human carcinogens (EPA weight-of-evidence classification B2).

Benzo(a)anthracene and chrysene are members of a group of chemicals known as polycyclic aromatic hydrocarbons (PAHs). PAHs are formed during the incomplete burning of coal, oil, gas, garbage, and other organic substances and can be either man-made (cigarette smoke, automobile emissions, asphalt production) or occur naturally (volcanoes, forest fires). Little information is available about the health effects of individual PAHs. Lung cancer and skin cancer have been documented in humans exposed to mixtures of PAHs through the inhalation or dermal contact routes (ATSDR, 1990).

Bis(2-ethylhexyl)phthalate (BEHP) is a chemical used to make plastics more flexible, such as rainwear, flooring, and medical tubing. Animal studies indicate that liver cancer, other adverse liver effects, and adverse reproductive effects are associated with the ingestion of BEHP. However, evidence of carcinogenicity and adverse effects in exposed human populations is inadequate. Three other phthalate esters were also detected in the soils of LDU CPP-64: diethyl phthalate, butylbenzyl phthalate, and di-n-butyl phthalate. All are associated with adverse liver and reproductive effects in animals. Of these three, butyl benzyl phthalate is also a possible human carcinogen (EPA weight-of-evidence classification C) based on suggestive evidence in animals but with no supporting data in humans. The concern with this group of chemicals has arisen because of their widespread occurrence at low levels in the environment. BEHP and other phthalate ester plasticizers have been found to be general contaminants of virtually all soil and water ecosystems (Klaassen et al., 1986).

Three volatile organic chemicals were also detected in soil samples from LDU CPP-64. These chemicals are ethylbenzene, toluene, and xylene. None of these chemicals have been classified by EPA as potential animal or human carcinogens. All have similar chronic toxicity effects including liver and kidney damage with long term exposure (Proctor et al., 1988). Although these chemicals are related to benzene, they have not produced blood abnormalities similar to those associated with benzene exposures.

In addition to mercury, all of the organic chemicals detected, although found at very low levels, are evaluated in this HEA. Health assessment of effects from the unknown volatiles and semivolatiles is not possible without identification of the chemicals.

5.2 Identification of Exposure Pathways

All contaminants detected appear to be localized in the upper four feet of the soil except di-n-butyl phthalate, which had the highest level detected at 4 - 6 feet. (See Tables 4.3 and 4.4). Incidental soil ingestion or dermal contact with the soils are potential exposure pathways for all of the contaminants. In addition, toluene, xylene, and ethylbenzene are contaminants that could volatilize and could potentially be associated with inhalation exposures. The remaining organic contaminants have very low vapor pressures and under normal conditions airborne vapors should be minimal or nonexistent. The depth to ground-water, the lack of surface water bodies in the vicinity, and the low levels of soil contamination by the compounds detected preclude any significant impact on ground and surface water.

5.3 Identification of Receptor Populations

The typical receptor for contaminants present at LDU CPP-64 are workers at the ICPP. The ICPP is a secured industrial site with limited access.

5.4 Human Health Assessment

Several criteria are used to assess the potential human health effects of the soil contaminants identified at LDU CPP-64. The results of the assessment are summarized in Table 5.1. The first criterion is the calculation of a soil concentrations resulting in no systemic toxicity based on a sensitive population (16 kg child, ingesting 200 mg soil per day for a 5 year exposure period). The criterion is the soil concentration resulting in an oral dose equivalent to the applicable chronic reference dose (RfD) for each contaminant. The RfD for a contaminant is the daily intake of the contaminant to which even a sensitive individual might be exposed without developing documented critical toxic effects.

If contaminants are carcinogens, then a second criterion is also calculated to evaluate the level of contaminant present in the soil. For carcinogens, the criterion is based on the soil concentration, if ingested, that would be equivalent to a cancer risk of 1E-06. A cancer risk of 1E-06 or less is generally considered insignificant for regulatory purposes (40 CFR 300.430). General assumptions for this include a 70 kg person, ingesting 100 mg soil per day for 70 years. Both the systemic screening and the carcinogenic screening are conducted as recommended in the RCRA Facility Investigation Guidance (EPA, 1989).

None of the soil concentrations detected exceed the criteria based on the RfD (see Table 5.1). Therefore, systemic adverse health effects would not be expected in individuals exposed to soil contaminants at the levels detected in the soils at LDU CPP-64. For the carcinogens, bis (2-ethylhexyl)phthalate and butylbenzyl phthalate, the soil concentrations associated with a 1E-06 cancer risk are orders of magnitude greater

Table 5.1

Summary of Health and Environmental Assessment for LDU CPP-64

Constituent	Maximum Detected Soil Concentration (mg/Kg)	Screening Criteria				
		Chronic Oral RfD (mg/Kg/d)	Soil Concentration = RfD (mg/Kg)	Oral Slope Factor $(mg/Kg/d)^{-1}$	Soil Concentration = 1E-06 Risk (mg/Kg)	TLV(a) (mg/m^3)
Inorganics Mercury	0.12	3E-04(b)	24	--	--	0.1
Organics Benzo(a)anthracene	0.075	--(c)	--	(c)	--	--
Bis(2-ethylhexyl)phthalate	1.5	2E-02(d)	1,600	1.4E-02(d)	50	5
Butylbenzylphthalate	0.61	2E-01(d)	16,000	1.4E-02(e)	50	--
Chrysene	0.12	--(c)	--	(c)	--	0.2(f)
Diethylphthalate	1.9	8E-01(b)	64,000	--	--	5
Di-n-butylphthalate	2.0	1E-01(d)	8,000	--	--	5
Ethylbenzene	0.023	1E-01(b)	8,000	--	--	434
Toluene	0.004	3E-01(d)	24,000	--	--	377
Xylene	0.1	2E+00(d)	160,000	--	--	434

(a)Threshold Limit Value (ACGIH 1989).
(b)EPA 1990a.
(c)Quantitative data not determined (EPA 1990a).
(d)EPA 1990b.
(e)Surrogate based on BEHP.
(f)PEL for coal tar pitch volatiles.

RfD: Chronic Reference Dose

than the levels of these two contaminants detected in soils at LDU CPP-64. Thus, the cancer risk associated with ingestion of soils would be negligible. Because of the limited soil contamination and the type of industrial activities at LDU CPP-64, the contribution of dermal contact to the cancer risk, although not quantitatively evaluated, would also be expected to be negligible.

Benzo(a)anthracene and chrysene do not have published RfDs because data is inadequate for quantitative evaluation (EPA 1990a). Carcinogenic slope factors are also not available at this time (EPA 1990a, 1990b). Both are probable human carcinogens based on animal studies although definitive data from human studies is lacking. A surrogate slope factor for these contaminants could be assigned using the previously published oral slope factor of 11.5 $(mg/kg/d)^{-1}$ for a related compound, benzo(a)pyrene (EPA, 1984). Based on this surrogate, the soil concentration equivalent to a 1E-06 risk would be 0.06 mg/kg. Both benzo(a)anthracene, detected at 0.075 mg/kg, and chrysene, detected at 0.12 mg/kg, in soils at LDU CPP-64 would exceed this screening criteria. Although the concentrations of PAHs exceed the screening criteria, a more realistic, yet conservative, estimate of the risk associated with an occupational ingestion exposure can be calculated for the total concentration of benzo(a)anthrancene and chrysene, both of which are carcinogens. The estimated cancer risk for ingestion of soil contaminated with a total concentration of carcinogenic PAHs at 0.195 mg/kg (0.075 mg/kg and 0.12 mg/kg, soil concentrations of benzo (a)anthrancene and chrysene, respectively) is 6.2E-07. The 6.2E-07 risk is calculated using the standard EPA ingestion equation (EPA, 1989c) and conservative, upperbound exposure parameters as recommended by USEPA Region X (EPA, Region X, 1990) given below and using the slope factor for benzo(a)pyrene as a surrogate PAH slope factor:

$$\text{Slope Factor} \times \text{Intake} = \frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

where:

CS = Maximum soil concentration
IR = Ingestion Rate (100 mg/day)
CF = Conversion Factor (1E-06 kg/mg)
FI = Fraction ingested from contaminated source (100%)
EF = Exposure Frequency (36% of 365 days/yrs)
ED = Exposure Duration (40 yrs)
BW = Body Weight (70 kg)
AT = Average Time (365 d x 75 yrs)

It should be noted that benzo(a)pyrene is a very potent carcinogen and that risks predicted for other less carcinogenic PAHs such as those found at this site may actually be considerably less. In addition, the slope factor for benzo(a)pyrene is currently under review (EPA 1990a, EPA 1990b). Any risk associated with time because PAHs biodegrade in soils.

Because volatile organics were detected in the soils, a third screening criterion is used to evaluate the soil concentrations of contaminants with respect to their potential contribution to airborne contamination levels. A commonly acceptable occupational limit for these substances in air is given by the Threshold Limit Value (TLV). The TLV is a recommended exposure level in air expressed as mg/M^3 (mass/volume) or ppm (volume/volume). The TLVs for the three volatile organics are 434 mg/M^3 (ethylbenzene), 377 mg/M^3 (toluene), and 434 mg/M^3 (xylene) (ACGIH, 1989). The maximum soil concentrations of these contaminants (expressed as mass/mass) are 0.023 mg/kg (ethylbenzene), 0.004 mg/kg (toluene), and 0.1 mg/kg (xylene). Given these low soil concentration levels and the limited area of soil contamination (i.e. total mass of contaminated soil), dispersion and diffusion of volatile contaminants in the ambient air would result in air concentrations far below the corresponding TLVs.

Similarly, the TLVs for inorganic mercury, chrysene, and the phthalate esters are also presented in Table 5.1. The contaminant concentrations detected in soils at LDU CPP-64 do not pose an inhalation toxicity hazard. Based on soil concentrations of contaminants detected at the site, total airborne particulates (dust) would exceed the National Ambient Air Quality Standard for Particulates by at least 4 orders of magnitude before the airborne concentrations of these contaminants would pose a health risk.

Based on the screening provided above, the risk to workers occupationally exposed to the contaminants identified in the soil samples from LDU CPP-64 is considered negligible. The very low levels of contaminants present should not produce adverse systemic health effects. The risk of developing cancer from daily exposure to the carcinogenic contaminants present is also insignificant. Although data is insufficient to quantitatively evaluate the specific PAHs present in soils, an insignificant carcinogenic risk is estimated based on conservative industrial exposure assumptions using a more potent PAH surrogate. This estimate is very conservative due to the limited area of contamination, and the location of the contamination beneath the asphalt.

5.5 Environmental Assessment

LDU CPP-64 is located within the controlled boundaries of the ICPP. Zone 1 is a paved area and Zone 2 is a 10 ft by 25 ft unpaved area that does not support crops or plants. Large animals and migratory wildlife do not have access to or are not known to frequent this immediate area. No impact on terrestrial biota is anticipated.

Low annual rainfall will result in little surface runoff and infiltration. These conditions, in addition to the depth to groundwater (approximently 455ft) and low level of soil contamination will limit migration of contaminants and any adverse effects on surface waters or groundwater in the vicinity of LDU CPP-64. Consequently, surface water and groundwater will not be adversely impacted by the levels of soil contamination detected at LDU CPP-64. Impacts on downwind environments from airborne dispersion and diffusion of contaminants will be insignificant because of the low soil contaminant concentrations and the limited area of contamination.

6. SUMMARY AND CONCLUSIONS

This section presents a summary of the results of investigations at LDU CPP-64. Conclusions regarding the nature and extent of contamination detected and potential health or environmental effects associated with the contaminants detected are also presented. In addition, recommendations for additional investigations or corrective measures are presented.

6.1 Summary

Ten soil gas sampling locations (See Figure 3.0) were sampled at depths ranging from 0.5 to 6 feet. The soil gas was sampled and analyzed using an organic vapor analyzer (OVA).

Five boreholes were drilled and sampled to a depth of 6 feet. The five shallow boreholes were sampled at 0-2, 2-4, and 4-6 foot depths. Samples were analyzed for metals, volatile organics, and semivolatile organic compounds. Samples from one borehole were also analyzed for the 40 CFR Part 261 Appendix VIII constituents.

Results of the sampling and analysis are summarized below:

- Volatile organic compound concentrations in soil gas as measured with an OVA ranged from non-detectable to a single high reading of 500 ppm, with typical readings in the order of 2 to 10 ppm. These soil gas measurements were used to direct subsequent sampling locations for laboratory analysis, analyses of which are summarized in Table 5.1.

- Lead and mercury were detected at concentrations above the Upper Tolerance Limit (UTL) in at least one sample from the shallow boreholes.

- Hexone was not detected in any of the samples collected from LDU CPP-64.

6.2 Conclusions

Concentrations of detected target compounds at the site do not pose an unacceptable risk to human health or the environment. The concentrations of the inorganics detected at LDU CPP-64 do not pose a risk to human health or the environment and it is unlikely that permissible exposure levels (see Table 4.4) would be exceeded. Nine organic compounds were detected at LDU CPP-64 (See Table 4.2). None of these compounds were present at concentrations that pose a threat to human health or the environment. There is no need to conduct additional investigations at this site and removal, decontamination or closure as a land disposal facility under RCRA should not be required.

7. REFERENCES

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Reference 3

6-27-89

in - w/ mercantile soil.

20-25 bags

~~same~~ day as ~~spill~~ vermiculite ~~applied~~

Vermiculite ~~remained~~ on ground 3 day - then

placed in steel drums and sealed

Residual vermiculite was discovered

3-4 week later a very small

amount

Mark Hanson x ~~2325~~ x 3715 Foreman

Fork lift operator Bruce Ellis work for Steve Limberg ~~x 3572~~ x 3414

Pam

25 bags -

~~1 cu yd.~~ 1/2 cu yd.

Temperature was about 20°F

[illegible]

[illegible] of vermiculite.

did not see Heyone

~~[illegible]~~ 2 ft 6 in x 3 ft: 20

Move across with blade or fork lift

an 4.5 ft. [illegible] and 1/1.

0001523

Reference 4

TRACK-1 RISK EVALUATION SUMMARY

DATE: 1/24/92

SITE: CPP-64

SUMMARY:

A track-1 assessment was conducted to establish risk-based soil screening concentrations to evaluate hexone (methyl isobutyl ketone) contamination at CPP-64. Two zones of contamination were evaluated, as follows:

Zone 1: 3.05 m wide and 3.05 m long, with a depth of 1.83 m
Zone 2: 3.05 m wide and 7.62 m long, with a depth of 1.83 m

The calculation of soil screening concentrations was based on a target risk level representing a hazard quotient of 1 (based on noncarcinogenic effects) or a cancer risk of 1.0E-06 (based on carcinogenic effects). The evaluation followed the track-1 guidance for the assessment of low probability hazard sites at the INEL (DOE/ID-10340(91)).

Summary tables of risk-based soil screening concentrations for hexone, for each contaminated zone, are attached. Soil screening concentrations were calculated for both industrial and residential scenarios. The residential scenario considers exposures to individuals under contaminant conditions that would exist in 100 years (after institutional control). Four potential exposure pathways were evaluated, as applicable to hexone: soil ingestion, inhalation of fugitive dust, inhalation of volatiles, and groundwater ingestion (for residential scenario only).

The shaded box in the attached tables shows the lowest risk-based soil concentration for hexone. The ingestion of groundwater pathway provided the most significant risk (lowest risk-based screening soil concentration) for hexone.

SUMMARY TABLE OF RISK-BASED SOIL SCREENING CONCENTRATIONS FOR
CPP-64 (ZONE 1) SOIL CONTAMINATION FOR HEXONE

Exposure	Scenarios			
	Occupational		Residential	
Pathways	Soil Concentration at 1E-06 Risk (mg/kg)	Soil Concentration at HQ = 1 (mg/kg)	Soil Concentration at 1E-06 Risk (mg/kg)	Soil Concentration at HQ = 1 (mg/kg)
Soil Ingestion	--	1.00E+05	--	1.35E+04
Inhalation of Fugitive Dust	--	1.17E+08	--	8.49E+07
Inhalation of Volatiles	NA	5.27E+05	NA	4.20E+05
Groundwater Ingestion	NA	NA	--	8.37E+01

NA = Not Applicable.
-- = Calculation not performed because of no published toxicity value.
Shaded box = Lowest risk-based soil concentration.

SUMMARY TABLE OF RISK-BASED SOIL SCREENING CONCENTRATIONS FOR CPP-64 (ZONE 2) SOIL CONTAMINATION FOR HEXONE

Exposure	Scenarios			
	Occupational		Residential	
Pathways	Soil Concentration at 1E-06 Risk (mg/kg)	Soil Concentration at HQ = 1 (mg/kg)	Soil Concentration at 1E-06 Risk (mg/kg)	Soil Concentration at HQ = 1 (mg/kg)
Soil Ingestion	--	1.00E+05	--	1.35E+04
Inhalation of Fugitive Dust	--	4.69E+07	--	3.40E+07
Inhalation of Volatiles	NA	2.11E+05	NA	1.68E+05
Groundwater Ingestion	NA	NA	--	3.61E+01

NA = Not Applicable.
-- = Calculation not performed because of no published toxicity value.
Shaded box = Lowest risk-based soil concentration.

TRACK-1 RISK EVALUATION SUMMARY

DATE: 6/3/92

SITE: CPP-64

SUMMARY:

A track-1 assessment was conducted to establish risk-based soil screening concentrations for lead and mercury at CPP-64. The assessment supplements a previous assessment for hexone at the site. Two potential zones are considered; zone 1 is 3.05 m x 3.05 m in areal extent and 1.83 m deep. Zone 2 is 3.05 m x 7.62 m in areal extent and 1.83 m deep. Some toxicity data were inadequate and are so indicated in the attached tables. Lead toxicity data were not available for any pathway, so no table is included for lead. There exists interim guidance on soil lead cleanup levels at Superfund sites that can be used for screening, however. OSWER Directive #9355.4-02 gives a range of 500 to 1000 ppm as that level[1]. The EPA has classified lead as a probable human carcinogen. Mercury is not classifiable as to human carcinogenicity.

Summary tables of risk-based soil screening concentrations for mercury for each zone are attached. The evaluation followed the "Track 1 Sites: Guidance for Assessing Low Probability Hazard Sites at the INEL" [DOE/ID-10340 (91)]. The calculation of soil screening concentrations was based on a target risk level representing a hazard quotient of 1 (based on noncarcinogenic effects). Toxicity values were obtained from EPA sources (Health Effects Assessment Summary Tables, 1992). No credit was taken for any chemical degradation that may occur.

Four potential exposure pathways were considered, as applicable to the contaminant: soil ingestion, inhalation of fugitive dust, inhalation of volatiles, and groundwater ingestion. The shaded box in the attached tables shows the lowest risk-based soil concentration for each contaminant and zone. The lowest risk-based soil screening concentration for mercury was based on the soil ingestion pathway.

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[1] Determination of final cleanup levels should consider EPA memoranda and guidance subsequent to the interim guidance.

SUMMARY TABLE OF RISK-BASED SOIL SCREENING CONCENTRATIONS
FOR CPP-64 ZONE 1 SOIL CONTAMINATION FOR MERCURY

Exposure Pathways	Scenarios: Occupational — Soil Concentration at 1E-06 Risk (mg/kg)	Occupational — Soil Concentration at HQ = 1 (mg/kg)	Residential — Soil Concentration at 1E-06 Risk (mg/kg)	Residential — Soil Concentration at HQ = 1 (mg/kg)
Soil Ingestion	--	6.00E+02	--	8.1E+01
Inhalation of Fugitive Dust	--	5.04E+05	--	3.66E+05
Inhalation of Volatiles	NA	NA	NA	NA
Groundwater Ingestion	NA	NA	--	5.20E+02

NA = Not Applicable.
-- = Calculation not performed because of no published toxicity value.
Shaded box = Lowest risk-based soil concentration.

SUMMARY TABLE OF RISK-BASED SOIL SCREENING CONCENTRATIONS
FOR CPP-64 ZONE 2 SOIL CONTAMINATION FOR MERCURY

Exposure Pathways	Scenarios: Occupational — Soil Concentration at 1E-06 Risk (mg/kg)	Occupational — Soil Concentration at HQ = 1 (mg/kg)	Residential — Soil Concentration at 1E-06 Risk (mg/kg)	Residential — Soil Concentration at HQ = 1 (mg/kg)
Soil Ingestion	--	6.00E+02	--	8.1E+01
Inhalation of Fugitive Dust	--	3.18E+05	--	2.31E+05
Inhalation of Volatiles	NA	NA	NA	NA
Groundwater Ingestion	NA	NA	--	2.16E+02

NA = Not Applicable.
-- = Calculation not performed because of no published toxicity value.
Shaded box = Lowest risk-based soil concentration.